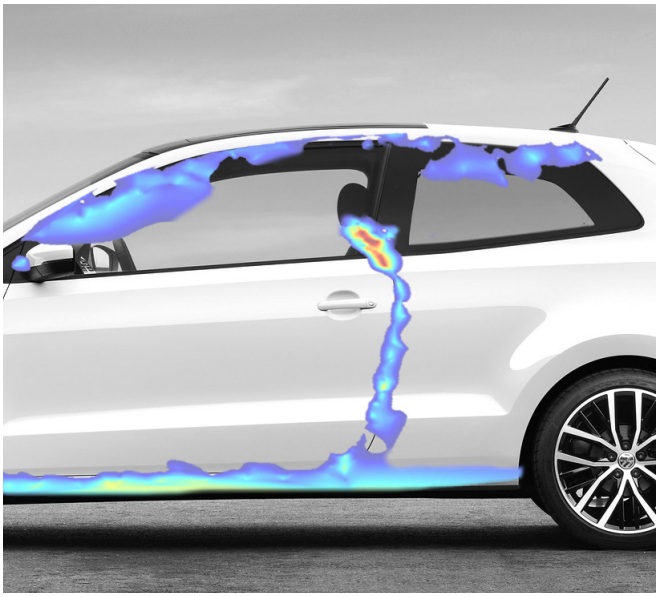
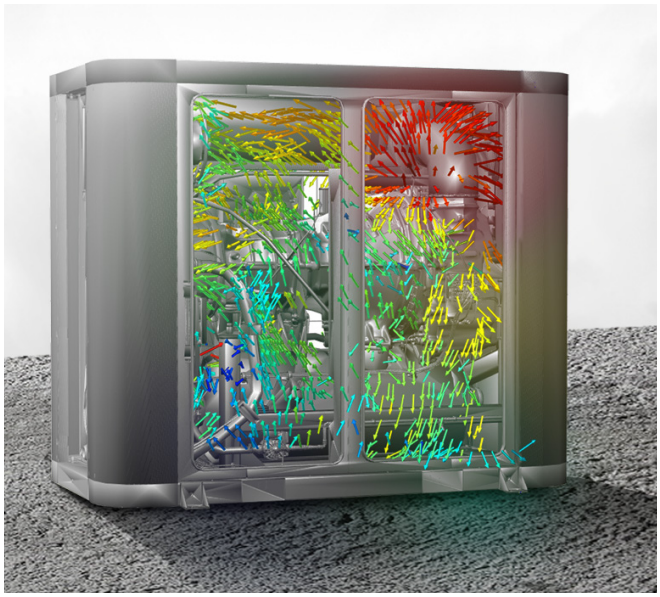
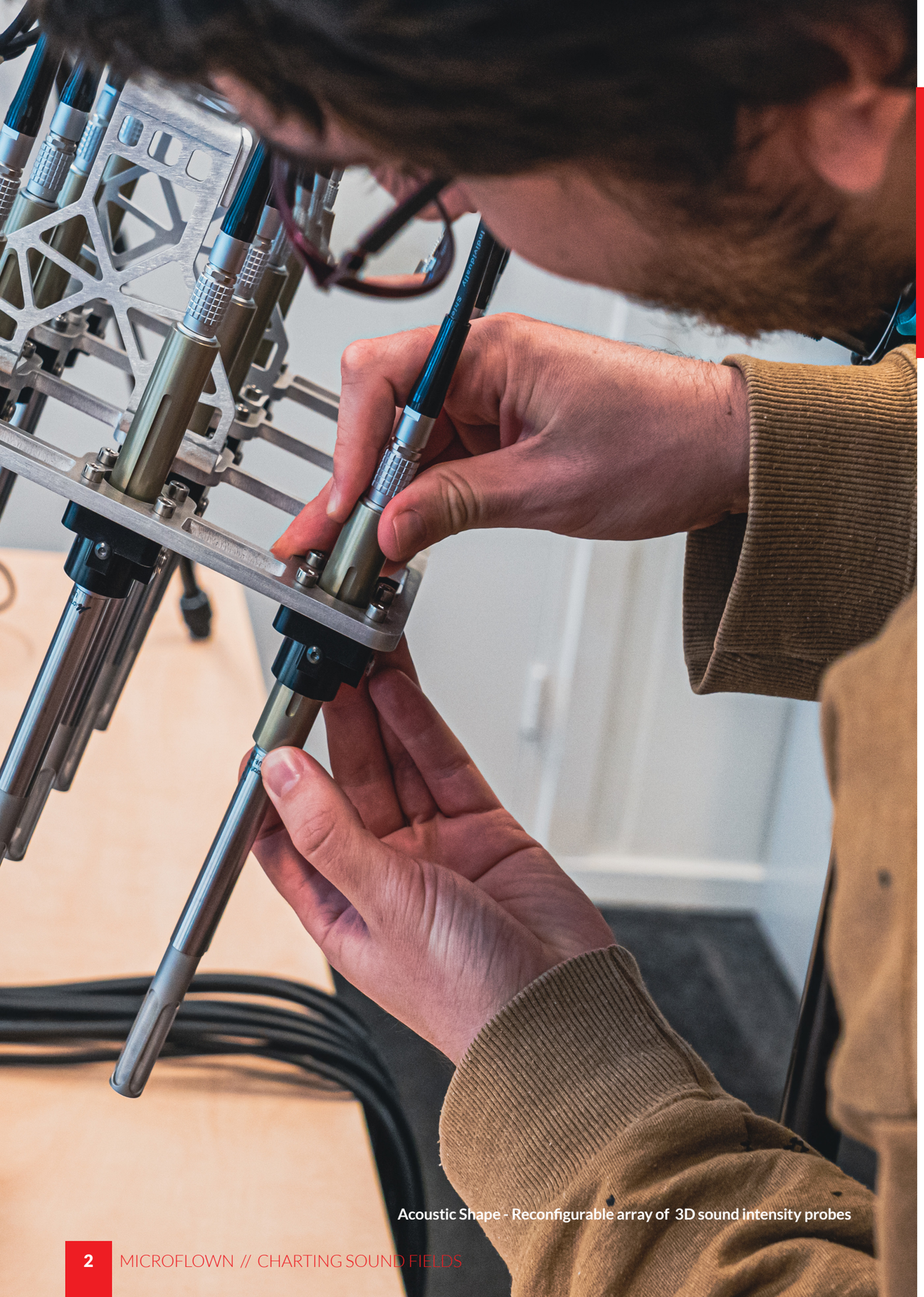
MICROFLOWN TECHNOLOGIES



ACOUSTIC SENSORS & MEASURING SOLUTIONS



PRODUCT CATALOG



Acoustic Shape - Reconfigurable array of 3D sound intensity probes

LEADERS IN CHARTING SOUND FIELDS

In 1994, in the cleanroom of the University of Twente, Hans-Elias de Bree discovered that the MEMS based thermal mass flow sensor he was working with was so sensitive that it had acoustic properties. The Microflown was born. In 1998, we cofounded Microflown Technologies, in essence with no clue on who would benefit from measuring particle velocity directly. Seasoned university professors wished us good luck and told us to prepare for ten years' lead time before industry would adopt, when at all. The chances of success were estimated to be ten percent.

We sailed the oceans, exploring markets like building acoustics and bioacoustics. We tried a passage into ISO certified markets. They did not let us in. We found our anchor harbor in the global manufacturing industry, where engineers always look for better tools to do the job.

Charting sound fields is not limited to visualization techniques. Above all, it is about capturing the correct data with sufficient spatial resolution. The uniqueness of the Microflown sensor, the algorithms applied to the captured data and the user friendly tools, provide the mapping as outcome.

Today, the Microflown team, and all its international partners, built a web of highly knowledgeable professionals that travel the world helping engineers to make their products quieter and more reliable. Naming our latest product, the Voyager is a tribute to all who took, and take, the courage to make the Microflown sensor what it has become now.

Indispensable for the true professionals.

MSc. Alex Koers
Cofounder & Director

CHARTING SOUND FIELDS

THE PARTICLE VELOCITY SENSOR: CHANGING THE FIELD OF ACOUSTICS

Microflown Technologies

Microflown Technologies was founded in 1998 by Hans Elias de Bree and Alex Koers, building on de Bree's invention of the particle velocity sensor in 1994. The Microflown sensor is a one-of-a-kind acoustic sensor, and the first to directly measure particle velocity as a physical quantity. Over the past two decades, we have garnered customers from around the world and have established ourselves as a crucial component in the study and measurement of sound fields. Currently, Microflown focuses on delivering high-quality acoustic measurement solutions that help to make the world a quieter and more pleasant place

Foundation

Founded as an innovative start-up project at the technical University of Twente, situated in the Dutch technology hub. It was here that de Bree completed his PhD and assembled a team of international researchers and engineers. After several years of research and development, a broadband and industrialized particle velocity sensor was finally introduced to the market in 2003, and has been known as the „Microflown" sensor ever since. Following its introduction, the company experienced rapid growth and eventually relocated to its own headquarters in Arnhem.

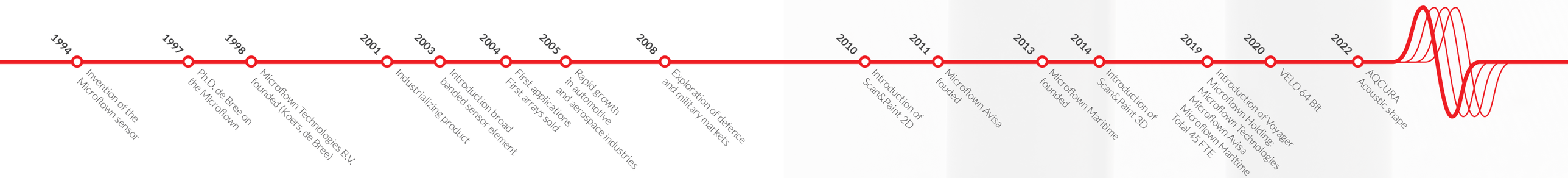
Innovation

The Microflown sensor is a major breakthrough in the field of acoustics, allowing for a greater understanding of complex vibro-acoustic phenomena. The company has developed new measurement techniques and offers a range of solutions for 2D and 3D sound visualization, noise quantification and automated end-of-line quality control. Resolving noise issues, comparing acoustic performance, and enhancing the acoustic footprint of your products is now easier than ever.

Quality

Microflown sensor technology powers our measurement solutions, which are the result of extensive R&D by a dedicated team of engineers. We constantly improve and update our technology to meet the latest quality standards. Our sensors are manufactured using clean room technology, and the rest of the assembly process is carried out by experienced employees who follow strict guidelines. All of our hardware development is designed, developed, and manufactured in-house. This commitment to quality and innovation allows us to provide reliable and effective acoustic measurement solutions to our customers.

PU Match 0 & 90 degrees



SALES REPRESENTATIVES

● Head office: Microflown Technologies B.V.
Tivolilaan 205
6824 BV Arnhem
The Netherlands

● Sales representatives: Australia, Austria, Belgium, Brazil, Canada, China, Colombia, Croatia, Finland, France, India, Italy, Germany Japan, Malaysia, Norway, Poland, Portugal, Russia, Serbia, Singapore, Slovenia, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirats, United Kingdom, United States.

Visit our website for detailed and up to date contact information

WE PROUDLY WORK WITH THE BEST

AUTOMOTIVE

The automotive industry is constantly evolving, with new models being introduced at a faster pace and customer expectations for comfort, fuel efficiency, and design higher than ever before. Additionally, regulations for lower fuel consumption and environmental impact play a significant role in the design and engineering of today's cars. This is why testing for noise, vibration, and harshness (NVH) is more important than ever. Microflown Technologies offers innovative testing solutions for the NVH market, utilizing our MEMS-based Microflown sensor to physically measure acoustic particle velocity. With this technology, we can provide accurate and reliable data for a wide range of testing applications, including Panel Noise Contribution Analysis, Near Field Acoustic Camera, In-situ Absorption setup, and Acoustic end of line control. These solutions not only improve comfort and product quality but also ensure compliance with industry regulations. Additionally, our testing methods are efficient and can be conducted in real-world conditions, without the need for anechoic chambers, which makes it easier to troubleshoot powertrain issues and conduct end-of-line control for car components. At Microflown Technologies, we strive to make the world a more quiet place through our innovative testing solutions and are dedicated to being a partner in achieving a quieter world, one car at a time.

AUTOMOTIVE / OEM

AUTOMOTIVE / SUPPLIERS

GROUND VEHICLES

APPLIANCES & ELECTRONICS

Technology advancements have greatly impacted daily life, raising the standard of living. With devices such as computers, washing machines, and vacuum cleaners becoming increasingly prevalent in our homes, the need for detailed analysis and evaluation of these products has become more important than ever. In the home appliance industry, perceived sound of a product can be a major differentiator. Microflown Technologies offers innovative testing solutions for noise, vibration, and harshness (NVH) in home appliances. Our solutions include sound mapping and localization, noise quantification, and ranking, which help increase quality and reduce time, cost and risk. Our unique sensor allows for in-situ measurements, eliminating the need for anechoic conditions and providing engineers with time-efficient tools. The small size of the sensor also allows for measurements with high spatial resolution, even on small products such as computer motherboards or mobile phones. As the home appliance industry continues to evolve, Microflown Technologies is committed to providing cutting-edge solutions to help manufacturers stay ahead of the curve.

HEAVY INDUSTRY & MACHINERY

Evaluating the noise emissions of large machinery can be a challenging task due to the lack of in-situ measurement procedures available. Pressure-based techniques often struggle to adapt to industrial scenarios, as high background noise levels and the reverberant characteristics of most industrial sites can make it difficult to apply standard sound characterization techniques. However, particle velocity measurements performed near a rigid radiating surface can provide a solution to this problem. These measurements are less affected by background noise, and are vector-based, which allows for identifying and quantifying noise emissions from problematic elements, even in high-noise environments. The intrinsic dependency on surface displacement and sensor directivity of particle velocity measurements are the main advantages over sound pressure-based solutions, making it a superior option for evaluating the noise emissions of large machinery.

AEROSPACE & AVIATION

Microflown Technologies offers a wide range of vibro-acoustic testing methods for the aerospace industry, including solutions for fixed wing aircraft, helicopters and UAVs. Our focus is on both reducing cabin interior noise as perceived by passengers and crew, as well as exterior noise perceived on the ground. The company actively participates in numerous national and international R&D projects, including the EU 7th framework, to stay at the forefront of innovation in the aerospace industry.

END-OF-LINE QUALITY CONTROL

Microflown Technologies offers AQCURA, a cutting-edge solution for end-of-line testing in loud factory environments. Combining machine learning with our proven vibro-acoustic testing methods, AQCURA enables in-line testing with high accuracy and traceability through database systems. Say goodbye to expensive, subjective solutions and hello to a new era of efficient and reliable end-of-line testing with AQCURA.

THE PARTICLE VELOCITY SENSOR

What is particle velocity?

Acoustic particle velocity refers to the velocity of air particle oscillations, typically measured in meters per second. It can be used to study a wide range of phenomena, including vibro-acoustic emission, sound propagation, acoustic absorption and scattering. When it comes to acoustics, airborne particle velocity is a crucial measurement, as it can provide important information about the source and behavior of sound waves. By measuring the velocity of particles in the air, it is possible to determine the level and frequency content of a sound, as well as its direction and spatial distribution. Additionally, it can be used to investigate the effect of sound on structures and people, and can be applied in a variety of fields such as architectural acoustics, environmental noise, and industrial noise control.

Microflown: MEMS based sensor technology

The Microflown sensor element is an innovative MEMS-based sensor that utilizes clean room technology to create incredibly small sensor components on silicon wafers. This sensor element consists of two exceptionally thin wires, which are about 400 times thinner than a human hair. These wires act as platinum resistors, effectively functioning as temperature sensors.

When an electrical current is applied to the wires, they heat up, leading to a corresponding increase in resistance. As particle velocity, or sound, passes perpendicularly across the wires, it induces an asymmetrical change in temperature distribution around the resistors. This asymmetry results in a noticeable difference in resistance. Consequently, the sensor generates a broad-band signal ranging from 20Hz to at least 10kHz, exhibiting a figure-eight directivity pattern that is proportional to the particle velocity. Remarkably, this measurement principle remains accurate even when subjected to sound levels up to 150dB.

To ensure optimal performance, the unique measurement principle of the Microflown sensor requires a dedicated pre-amplifier. Therefore, all Microflown sensors are equipped with a specialized signal conditioner specifically designed to complement the sensor and enhance its overall functionality.

Production of Microflown sensor elements on silicon wafers

LESS SUSCEPTIBLE TO BACKGROUND NOISE

The Microflown sensor is a cutting-edge technology that offers a significant advancement over traditional methods of sound measurement. Unlike conventional microphones, which only measure sound pressure, the Microflown sensor measures the three-dimensional particle velocity of sound waves. This provides a more comprehensive understanding of the physical behavior of sound waves in a given environment. Additionally, the Microflown sensor is uniquely designed to be able to make accurate measurements in non-anechoic conditions, such as industrial facilities, test labs, and office spaces. The two most important benefits of this are the ability to measure sound under real-world conditions and the ability to accurately identify and quantify noise emissions from specific sources, even in environments with high levels of background noise. This makes Microflown sensor an ideal solution for industries such as aerospace, automotive and manufacturing.

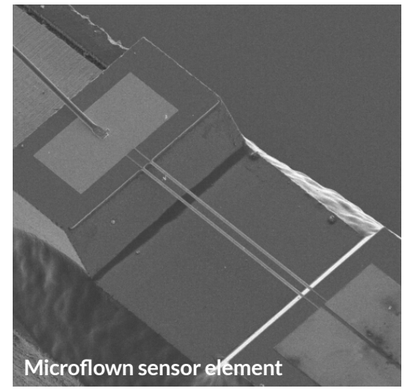
Near Field Effect

Measurement of normal particle velocity close to a surface of a sound source is less affected by background noise than a sound pressure measurement would be. This effect is caused by near-field properties of a sound source. Such phenomena is referred to as the near field effect. In order to understand the implications of the near field effect we will study two scenarios:

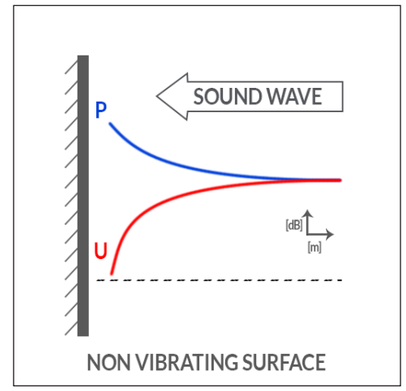
1. When measuring sound pressure in the presence of background noise and gradually decreasing the distance between the measurement point and a rigid surface, the amplitude of sound pressure will increase as sound reflects off the surface. In contrast, normal particle velocity will decrease in proximity to a rigid surface.
2. When measuring sound pressure in an environment without background noise and gradually decreasing the distance between the measurement point and a vibrating surface, the sound pressure level will increase linearly. However, with particle velocity, the amplitude will increase exponentially near the source surface, becoming the dominant source of excitation and suppressing external sound sources.

Figure-of-eight Directivity

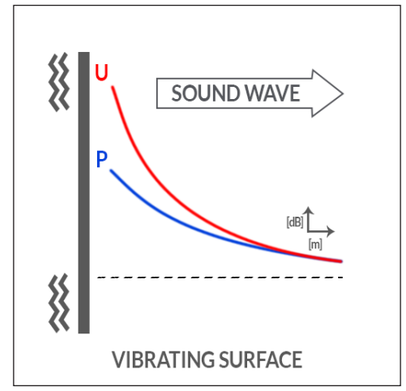
The Microflown particle velocity sensor, unlike traditional sound pressure microphones, has a unique figure-of-eight sensitivity pattern. This directivity pattern allows the sensor to selectively measure the particle velocity in a specific direction, while disregarding 1/3 of the total sound field. This is particularly useful in situations where there is a high level of background noise or multiple sound sources present. The figure-of-eight pattern also allows for more accurate and precise measurements, as it eliminates the effect of reflections and other unwanted sound sources, making it an ideal solution for measuring sound in industrial and other challenging environments.



Microflown sensor element



NON VIBRATING SURFACE



VIBRATING SURFACE

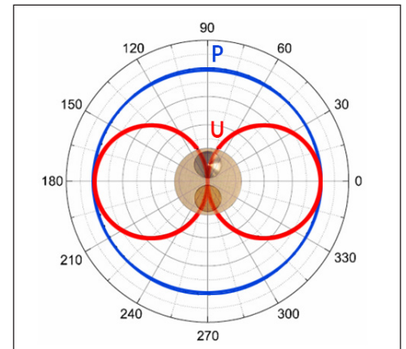


FIGURE OF EIGHT

MEET THE FAMILY

USP

3x Particle velocity sensor
1x Sound pressure microphone

PU

1x Particle velocity sensor
1x Sound pressure microphone

VELO SOFTWARE PLATFORM

INTUITIVE, EASY AND FAST

Velo, Microflown's software platform for sound field analysis and visualization, offers a streamlined and user-friendly experience from setup to results analysis and reporting. With a variety of tools at your disposal, Velo enables you to perform any task with ease and achieve accurate results every time. This fully customizable platform integrates the functionalities of multiple Microflown systems into one solution, and can be easily upgraded with additional software applications or add-on modules.

Velo is the go-to platform for Microflown's main measurement solutions, sharing the same resources such as probe calibration database and following a consistent, efficient workflow. This allows for minimal time and investment for users to upgrade to other Microflown solutions. Additionally, Velo enables users to open measurement files in other software modules, such as using the Analyzer module to load Scan & Paint 3D measurement files, giving users the freedom to process their data without any limitations.

Velo updates are released frequently, including new features, enhanced algorithms, and improved performance. Microflown Software Service Contract holders have access to the latest version of Velo and a range of other benefits. For more information see the Service section at page 62.

MICROFLOWN

VELO

Analyser
Time and frequency domain analysis
Order tracking & RPM analysis
Sound Ranking, TL & PNC

Scan&Paint 2D
2D sound field visualization
Single sensor solution
Acoustic near field measurement
Sound power ranking

Scan&Paint 3D
3D sound field visualization
Single sensor solution
Time-stationary noise
Sound power ranking

NF Acoustic Camera
2D sound field visualization
Non-stationary noise
Order tracking & RPM analysis

In-Situ Absorption
In-situ acoustic material testing
Sound absorption and reflection
Acoustic impedance

Acoustic Shape
3D sound visualization
Non-stationary & impulses
Order tracking & RPM analysis

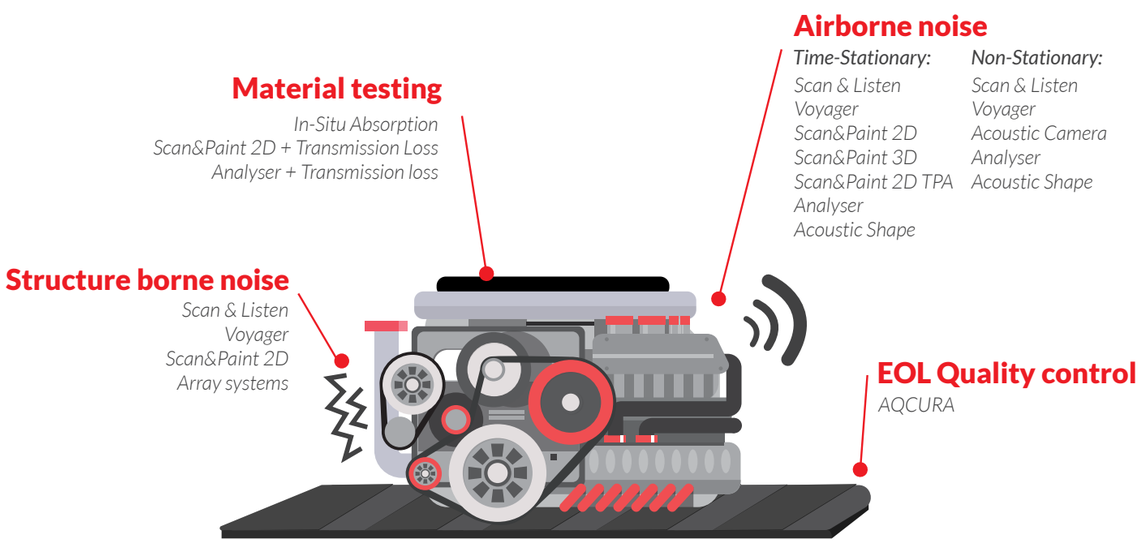
CHOOSE YOUR SOLUTION

MICROFLOWN ACOUSTIC TESTING SOLUTIONS

Over the years Microflown developed numerous acoustic testing solutions for a wide range of applications and industries. Microflown Technologies has established itself as a game changer with novel sound field visualization techniques.

Each of our solutions is an all-inclusive portable system. Everything from sensor to software is ready to use. We offer fast, easy and accurate methods for sound field visualization and material testing. All our solutions are based on one or more particle velocity sensors and sound pressure microphones, thus allowing you to obtain a thorough understanding of acoustic phenomena present in the sound field. Furthermore, thanks to the properties of the Microflown sensor, it is possible to perform accurate measurements in non-anechoic conditions and in the presence of background noise.

Choose your solution based on the characteristics of your sound field: for time stationary noise sources, scanning techniques are recommended, since they relay on just one sensor, thus making them a cost efficient option. For non-stationary sound fields, where noises like squeaks, rattles and clicks are present, a simultaneous multipoint measurement is necessary. In such case, the Near Field Acoustic Camera equipped with near field acoustic holography and direct sound field visualization capabilities would be a perfect choice.



PU Match array for consumer electronics and actuators

ADD-ONS

MAXIMIZE YOUR SENSOR'S POTENTIAL WITH OUR ADD-ONS

Microflown offers a range of tailored solutions to suit various applications, all of which are built around our advanced Microflown sensor. If you are a proud owner of a Microflown probe or one of our measurement solutions, we invite you to explore our diverse selection of software and hardware „add-ons". These add-ons are efficient and attractive options that can significantly expand the measurement capabilities of your sensor by incorporating new processing capabilities and extra hardware components. We encourage you to reach out to us and discover how we can help you achieve even more with your sensor through other possible combinations.

SCAN & PAINT 2D

BROADBAND HIGH SPATIAL RESOLUTION SOUND MAPPING

Sound source localization is an important topic in the field of sound & vibration, from product development stage to the end of line quality control.

Scan & Paint 2D is a fast, easy and accurate tool to visualize stationary sound fields with an unmatched spatial resolution and in a broad acoustic bandwidth (20 Hz - 14 kHz).
The system is a superb engineering tool for troubleshooting or benchmarking all kinds of objects on the spot. It only takes a few minutes to complete and entire measurement campaign. Results of the scan are translated by the software into a color map, superimposed on a photograph of the measured object, allowing to find the origin of noise.Measurements with Scan & Paint 2D do not require anechoic conditions. In practice, there are many cases where placing a measured object inside of an anechoic chamber is not possible, for instance some large industrial machinery or a car interior. Scan & Paint 2D allows for direct measurement and visualization of particle velocity, which is not highly affected by background noise, or reflections. Moreover, sound intensity measurements can be taken even in situations with a high sound pressure to sound intensity ratio.

HOW DOES IT WORK?

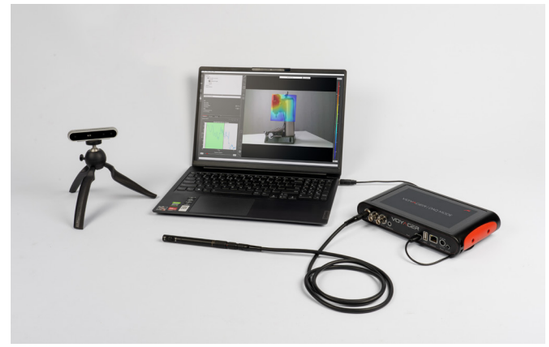
Scan&Paint 2D uses a simple and effective method for measuring time-stationary sound fields. The surface of the object being measured is scanned with a single PU GEN 2 probe, which is simultaneously captured by a camera. The recorded video and probe measurement data are automatically synchronized while the positions of the probe are extracted using live IR-LED tracking. This information is then used to produce high-resolution acoustic imaging, which shows the origin of noise on the object. Our unique probe sensing technology allows us to achieve high-resolution imaging with a wide range of frequencies, even in challenging environments such as large industrial machinery or car interiors. With Scan&Paint 2D, size doesn't matter, measuring anything from small hearing aids to large gas compressors is possible. Additionally, a reference sensor can be added to preserve the relative phase for the measured particle velocity distribution, enabling to plot and study the dynamic behavior of the measured surfaces.

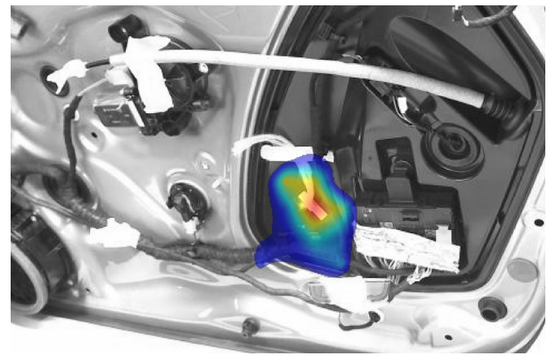
TYPICAL APPLICATIONS

- Sound field visualization
- Sound source localization
- Leak detection
- Troubleshooting
- Benchmarking

FEATURES

- **Broadband Solution: 20Hz - 14kHz**
- **Real-time probe position tracking**
- **High resolution mapping of:**
  - **Particle velocity**
  - **Sound intensity**
  - **Sound pressure**
- **Fast & Easy, results in minutes**
- **Applicable in any environment**
- **Reference sensor for phase correlation and ODS**
- **Portable, single-sensor solution**
- **Fast: setup, measurement and processing time within a few minutes**





SCAN & PAINT 2D / IR TRACKING

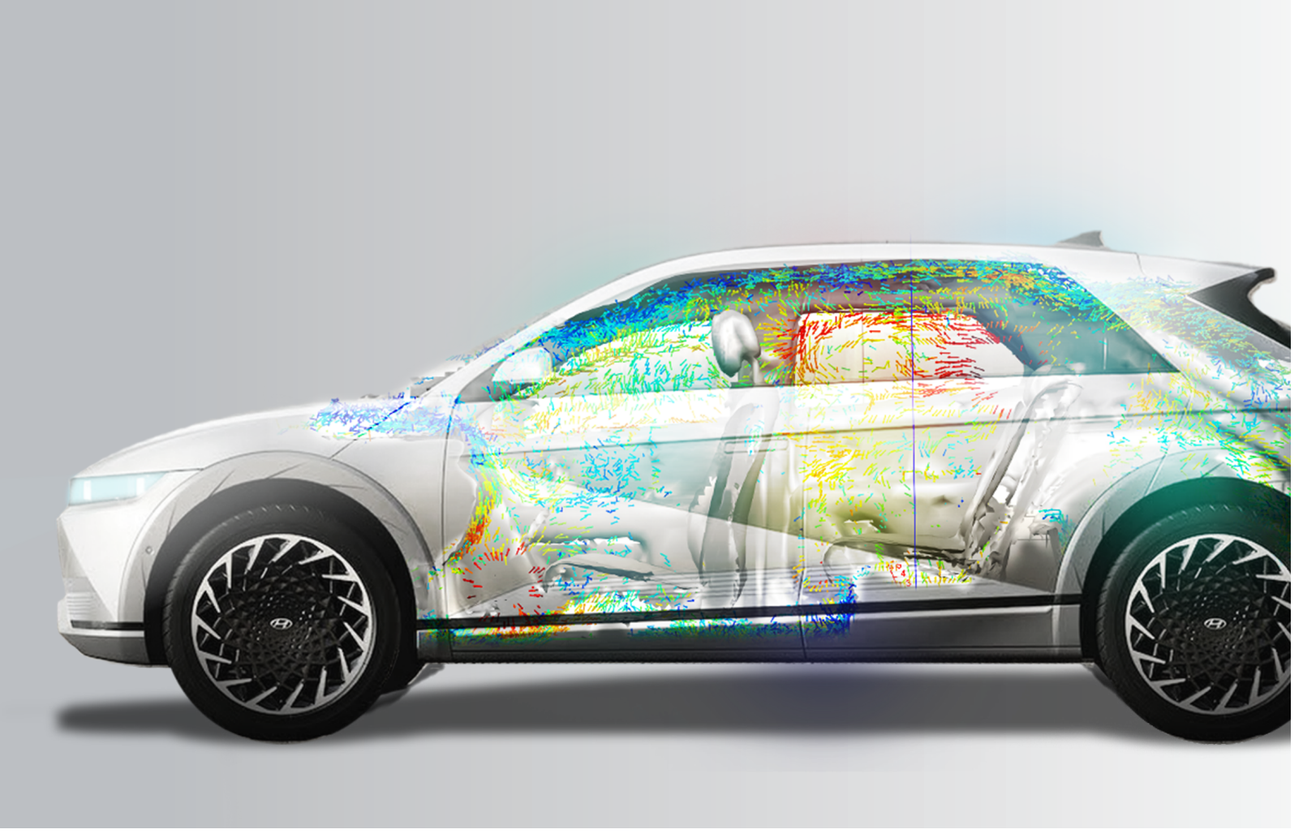
The Scan & Paint system can now utilize a real-time position tracking algorithm based on infrared (IR) lights. This advanced IR tracking technology accurately detects the position of the probe in the camera image, providing reliable and precise tracking performance. With its advanced IR tracking technology, the Scan & Paint system delivers accurate and reliable tracking performance in real-time.

REAL-TIME POSITION TRACKING WITH THE PU GEN 2 PROBE AND DUAL IR CAMERA TECHNOLOGY

The PU Gen 2 probe is equipped with two integrated IR LEDs that, when combined with a special camera with dual IR lenses, enable real-time position tracking while moving the probe. This feature is particularly useful when measuring with our Scan&Paint 2D, as it allows for the creation of high-resolution sound maps with unmatched dynamic ranges across a total bandwidth of 20Hz up to 14kHz. The real-time tracking feature makes it more straightforward and faster to obtain accurate results, saving valuable time and improving the overall efficiency of the testing process.

ENHANCING SOUND POWER MEASUREMENTS WITH INTEL REALSENSE CAMERA TECHNOLOGY

The addition of the Intel RealSense camera to our solution is a significant improvement, providing accurate real-time tracking capabilities and eliminating the need for manual measurement of the object's dimensions. The camera's depth information allows for the fast and easy extraction of the object's dimensions, which is valuable for directly measuring sound power. Paired with the PU Gen2 probe, the camera enables real-time IR recording and position tracking, saving valuable time with a single click. Additionally, the camera captures RGB images for post-processing and device imaging. This cutting-edge camera technology significantly enhances the accuracy, efficiency, and performance of our solution.



SCAN & PAINT 3D

3D SOUND VECTORS OVERLAID ON A 3D MODEL, IN JUST A FEW MINUTES

Introducing Scan & Paint 3D, the unparalleled solution for acoustic troubleshooting, sound source localization, and noise ranking. This unique tool allows you to visualize what you hear, making complex problems simple and easy to understand.

With Scan & Paint 3D, you can easily localize your sound sources and visualize the sound propagation in full 3D. The system offers you 3D sound vectors overlaid on a 3D model, giving you unmatched spatial representation. You can easily obtain results with a high spatial resolution, even on very small objects, due to the very small 3D sensor and the accurate real-time 3D tracking of the sensor position. The system provides you with a broad frequency range (20 Hz - 10 kHz) and an unparalleled dynamic range, which makes it a powerful and unique solution. Sound source localization is an important topic in the working field of sound & vibration, from the product development stage to the end of line quality control. The state-of-the-art Microflown USP probe used in the system allows the direct measurement of all acoustic quantities, including sound pressure and tri-axial particle velocity.

HOW DOES IT WORK?

3D scanning technology allows you to capture real-world objects and create a digital 3D model. To begin the process, you can either import an existing 3D model or scan the object using a 3D scanner. Once you have the 3D model, you can use specialized software to track the object's position and movement in 3D space. To do this, you need to calibrate the tracking system by pointing it at the object and defining reference points. Once the tracking system is calibrated, you can perform measurements on the object by using the software to analyze the 3D model. The results can be used for a wide range of applications, including manufacturing, reverse engineering, and quality control.

In just a few minutes, the complete sound field, as 3D sound intensity or particle velocity vectors, is displayed on a 3D model, making it easy for you to identify and rank noise sources. Moreover, the system offers an intuitive sound power feature that easily calculates the overall radiated sound power from the sound intensity data around your test object, allowing for easy sound power measurements.

TYPICAL APPLICATIONS

- Noise source identification and ranking
- Vehicle acoustics
- Powertrain
- Component testing
- Radiation patterns

FEATURES

- **Frequency range: 20 Hz - 10 kHz**
- **3D visualisation of:**
  - **Sound intensity vector**
  - **Particle velocity vector**
  - **Sound pressure distribution**
- **Sound power calculation**
- **Automatic 3D tracking of the sensor position**
- **3D modeling tools embedded. Supported file extensions for CAD import:**
  - **obj** - **3ds** - **dae** - **stl**
- **2D visualisation available for all angles of the 3D model**
- **Applicable in (real) operating environments**
- **Easy to operate**
- **Fast: setup, measurement and processing time within a few minutes**
- **Single sensor solution**

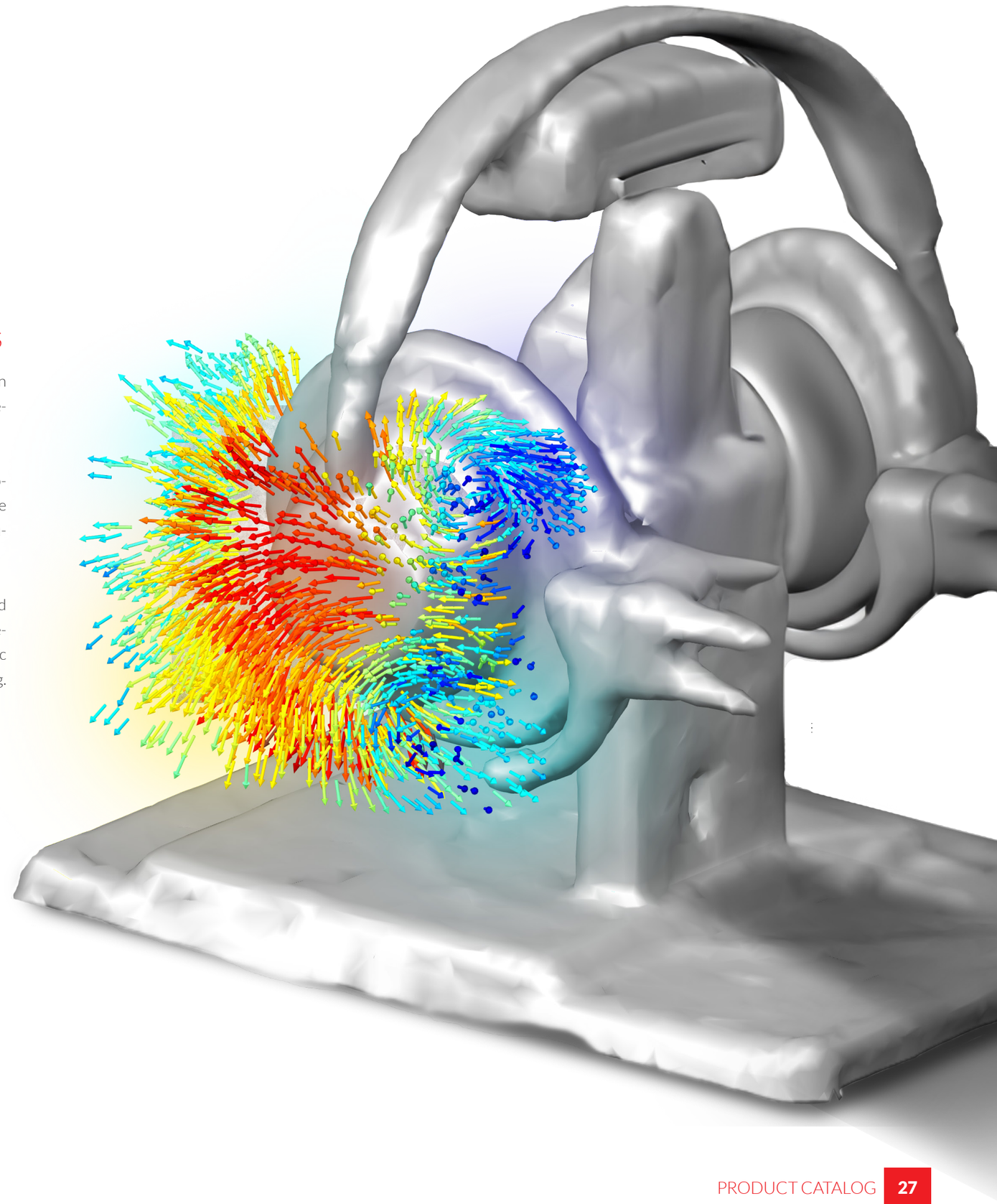
THE ALL-IN-ONE SOLUTION FOR ACOUSTIC TROUBLESHOOTING AND ANALYSIS

Scan & Paint 3D is a versatile tool that can be used in a variety of challenging environments, such as vehicle interiors or non-anechoic rooms, making it an excellent engineering tool for troubleshooting and benchmarking all types of objects directly in-situ. With 3D modeling tools embedded and support for file extensions such as obj, 3ds, dae, and stl, it is easy to import CAD models and use the same dataset for accurate broadband sound power calculation.

Exporting acoustic data is a crucial step in analyzing and understanding the sound properties of a given space. Visualizing acoustics as a vector can provide a more comprehensive view of the sound field, allowing for a more accurate representation of sound propagation and behavior. The exported results can be analyzed to gain insights into the acoustics of a given environment and make informed decisions about noise reduction and sound management.

The software also offers video exporting capability, enabling engineers to create even clearer representations of the acoustic behavior of a system and making it easier to communicate their findings to stakeholders.

In summary, Scan & Paint 3D is a fast, easy-to-operate, and single-sensor solution that provides unmatched spatial representation, making it the unparalleled solution for acoustic troubleshooting, sound source localization, and noise ranking.



VOYAGER

MOBILE DATA ACQUISITION & VIBRO-ACOUSTIC ANALYSIS

The Voyager is a portable NVH testing device that merges multiple functional units like data acquisition, signal conditioning and storage into a powerful tablet device for vibro-acoustic data recording, visualization and analysis.

This Voyager device is set to transform the NVH testing industry as the frontrunner in on-site measurements. The success of the Scan & Listen device, that allows one to gain understanding about the sound field by listening, led to the development of Voyager. the embedded software with touchscreen response allows a more intuitive and user friendly operation for real-time audio playback and comprehensive analysis of the acquired data. Besides conventional FFT and octave frequency analyses, the implementation of spectrogram analysis allows the user to also study non-stationary or transient noises. Targeted analysis with the help of real-time filters on a data channel optimizes the workflow and efficiency of the Voyager. The possibility of extension up to 6 channels allows autonomous measurement with reference microphones or accelerometers to correlate and compare data measurements. Compatibility with the Microflown range of sensors ensures utilising the superior advantages of the Microflown, in terms of background noise cancellation and signal-to-noise ratio. This allows using it directly at the test location in presence of environmental sounds.

Visualize, analyze and record data by means of just a single handheld device, making the Voyager an indispensable portable NVH testing tool.

HOW DOES IT WORK?

The intuitive device interface and modular applications make it easy for both NVH experts and technicians to use. Inspired by the user-friendly operation of mobile devices like smartphones and tablets, the Voyager was designed to provide a similar experience. The touch-controlled icons provide quick access to different modes and settings, allowing you to listen to signals in real-time, switch to playback or analysis mode with a single touch. The directly accessible and visible settings and options make for efficient operation. Intuitive toggles allow for quick activation or deactivation of features with a single touch. The icon-based menus provide a clear and spacious display for analysis data, achieving the ideal balance between ease of use and visual appeal. With real-time listening and filtering, spectrum visualization, and post-processing capabilities, the Voyager is a go-to tool for a variety of vibro-acoustic analysis. Upgrade to the Voyager Advanced to turn it into a powerful portable measuring station with built-in processing and signal conditioning units. Use the device independently or as a portable frontend for the PC-based VELO software platform.

TYPICAL APPLICATIONS

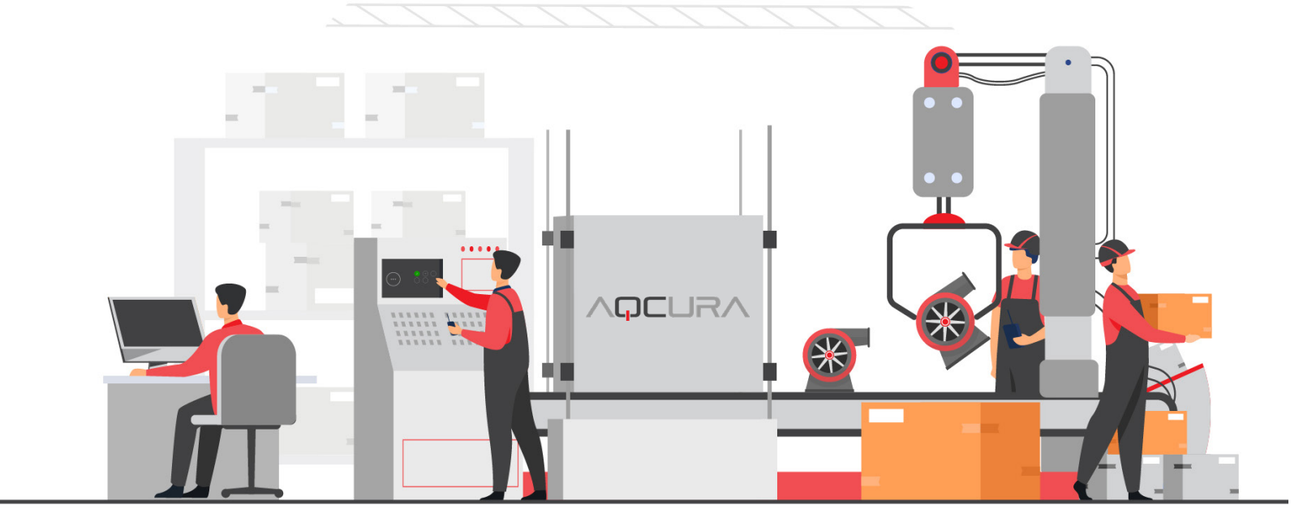
- Noise source identification
- Buzz, Squeak & Ratlle noise localization
- Quality and End-of-Line Control
- Acoustic leakage detection
- Acoustic analysis
- Sound intensity / sound power

OPTIONAL EXTENSIONS

- PU Voyager // PV
- Firmware licence: DAQ Mode // FW-VYR-DAQ
- Firmware licence: Sound Quality // FW-VYR-SQ

FEATURES

- **Quad-core powered compact touchscreen NVH testing tool**
- **Real-time listening & audio filtering along with signal playback and recording options**
- **Integrated data analysis software modules**
- **Applicable in operating environments**
- **Built-in battery and storage capacity for autonomous operation**
- **Compatibility with all Microflown probes and other (IEPE) sensors**
- **Integrated camera for comprehensive project management**
- **Two modes: autonomous or portable front-end**



END OF LINE
QUALITY CONTROL

FAST, EASY, ACCURATE AND NO NEED FOR ANECHOIC CONDITIONS

Microflown particle velocity probes provide the cutting edge in the field of acoustic end of line control. With Microflown particle velocity probes, products can be tested directly in the manufacturing environment without the need of removing them from the production line.

Compared to traditional microphones the Microflown probes have a up to 40 dB lower susceptibility to background noises and reflections. Furthermore the method is a non-contact method so there are no mass load effects or difficulties that occur when mounting the sensor on the test object.

Not only a ground breaking sensor but the combination of it with the knowledge and experience of our top engineers make it possible to deliver a complete end-to-end solution for any End Of Line (EOL) control application. From product analysis, testing procedure design up to production line implementation. We are capable of providing a customized solution that meets your expectations.

HOW DOES IT WORK?

Testing a manufactured unit at the end of the assembly line is a critical step in the production process. Any defective products must be separated from the functional units. Reliable detection of defective units is the primary objective of any EOL tests. Maximizing the output and minimizing the false rejection rate is the ultimate goal of our End of Line Quality Control applications.

Each product has its own unique vibro-acoustic behaviour pattern. Hidden within that pattern is crucial information regarding the functioning and condition of the product itself, as well as the manufacturing process that created it. The ability to take advantage of such information can significantly reduce manufacturing costs as well as the number of faulty products coming of the production line. Moreover, the non-destructive nature of acoustic EOL testing procedures enables their direct implementation on the production line itself.

Up till now numerous acoustic quality control procedures were encumbered by the physical properties of pressure microphones used in the control process. Acoustically sealed rooms, anechoic chambers, all require substantial resources and complicated measurement routines. With our particle velocity sensor you can forget about these arrangements! Moreover, the Microflown sensor can be used for acceleration measurements. This feature makes it a perfect non-contact alternative for existing accelerometer based EOL quality control procedures.

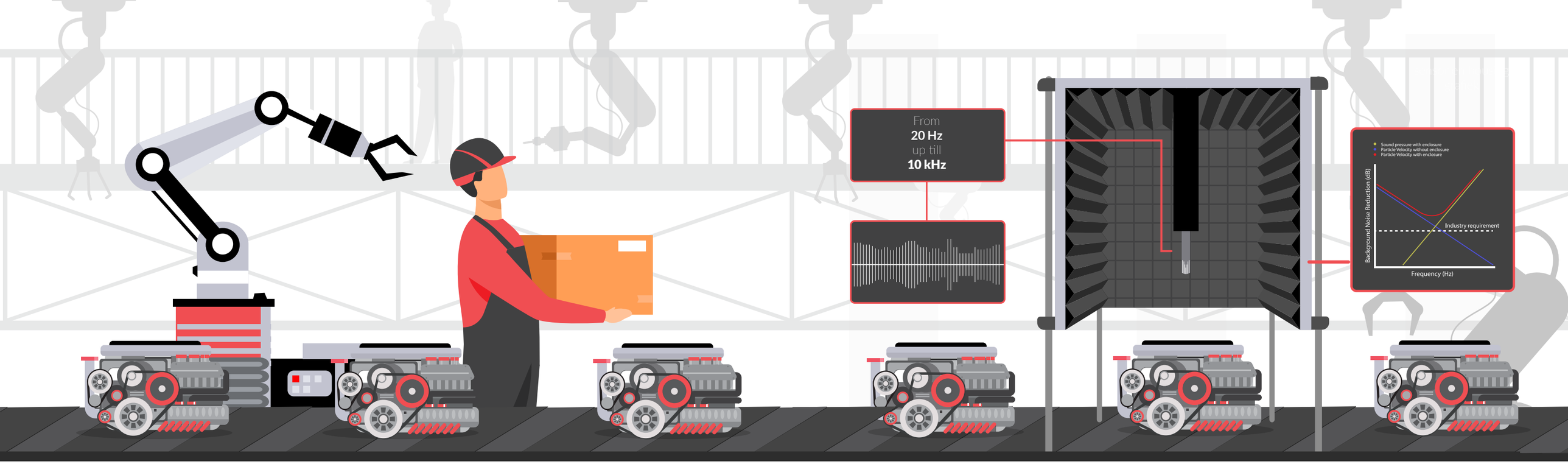
TYPICAL APPLICATIONS

- Product evaluation and quality control
- Acoustic EOL testing implemented in production line
- Balance testing of rotating components
- Non-contact vibration testing

FEATURES

- **Simple instrumentation: contactless sensors**
- **Automated objective testing**
- **Detects airborne- and structure-borne defects**
- **Traditional, Artificial Intelligence & Machine Learning tests**
- **Psychoacoustic prediction**
- **Controllable with an external control unit**
- **Simple and informative interface**
- **Automatic reporting for traceability**
- **Database storage**

AQCURA



THE AQCURA MANAGER

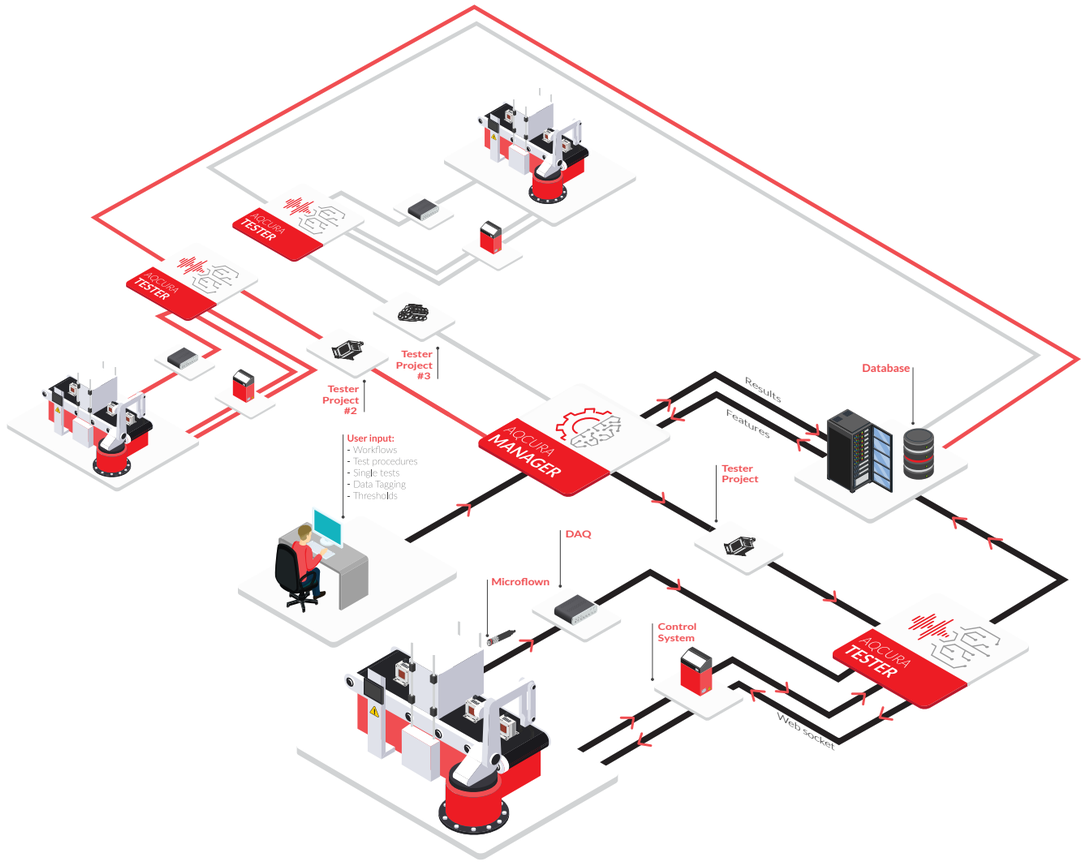
The Manager module of the AQCURA platform is designed to efficiently manage multiple Testers in various quality control stations within a factory setting. It enables users to create and manage Manager Projects, allowing customization of hardware setup, database connection, and communication with the Control System. Additionally, it facilitates workflow definition by creating, editing, and deleting Workflows, Test Procedures, Tests, Processing Trees, Features, and Report Templates.

In addition to the essential components for AQCURA Tester operation, the Manager module offers tools for data analysis, machine learning Test training, and threshold definition. It leverages data collected from the Tester at the end of the production line, either from measurement files or a database, providing a flexible environment for data analysis, evaluation of training performance, and population graphs. It also allows users to store and manage training sets in the database. Once the settings and training are complete, projects with all necessary definitions can be exported to run on the Tester.

All project modifications are traceable, enabling easy navigation between different versions of the entire project or individual components such as Workflows, Test Procedures, Tests, and Processing Trees. Moreover, the module includes playback tools for troubleshooting and feature design using measured signals.

THE AQCURA TESTER

The AQCURA Tester module in AQCURA software operates at the end of the production line, seamlessly executing complex test routines and various communication scenarios under the guidance of the Control System. By loading a Tester Project generated on the AQCURA Manager module, it obtains all the necessary settings and information for successful testing. This section covers the AQCURA Tester's operation, user interface, and an Integration Guide that explains vital aspects of communication with the Control System.



ACOUSTIC SHAPE

SEEKING A DEEPER UNDERSTANDING OF COMPLEX ACOUSTIC PROBLEMS

While traditional methods can provide accurate results, they often lack the comprehensive spatial information needed to truly understand intricate sound radiation mechanisms and interactions between system sub-components.

Acoustic Shape revolutionizes this approach with its advanced 3D visualizations and acoustic probe technology, fully integrated with the Velo software platform. Experience real-time tracking, multi-capture synchronization, noise visualization, and a wide array of analysis possibilities for an unparalleled insight into transient and non-stationary sound sources. Elevate your acoustic problem-solving with Acoustic Shape, the ultimate tool for sound field exploration and source localization.

Flexible Sensor Configurations

Acoustic Shape boasts a versatile software solution designed to accommodate a wide range of 3D acoustic probe configurations, from a single sensor to an extensive sensor array. The single probe configuration utilizes the same hardware components found in a Scan&Paint 3D solution, ensuring compatibility and seamless integration. Moreover, custom array solutions shown in previous research projects can be made available upon request, further demonstrating the adaptability and scalability of the Acoustic Shape platform for diverse measurement needs.

HOW DOES IT WORK?

Discovering the key components of Acoustic Shape

Acoustic Shape excels at capturing high-resolution 3D sound intensity vectors for time-varying operational regimes, enabling precise sound localization and noise quantification in non-stationary acoustic challenges. To begin, a 3D model of the test object is needed, which can be imported from a CAD file or acquired by scanning the area of interest. An IR optical tracker is positioned relative to the object under assessment, capturing real-time position and orientation information of a 3D acoustic probe (array) that allows for quick and efficient point-by-point measurements without further software adjustments.

The data acquisition process

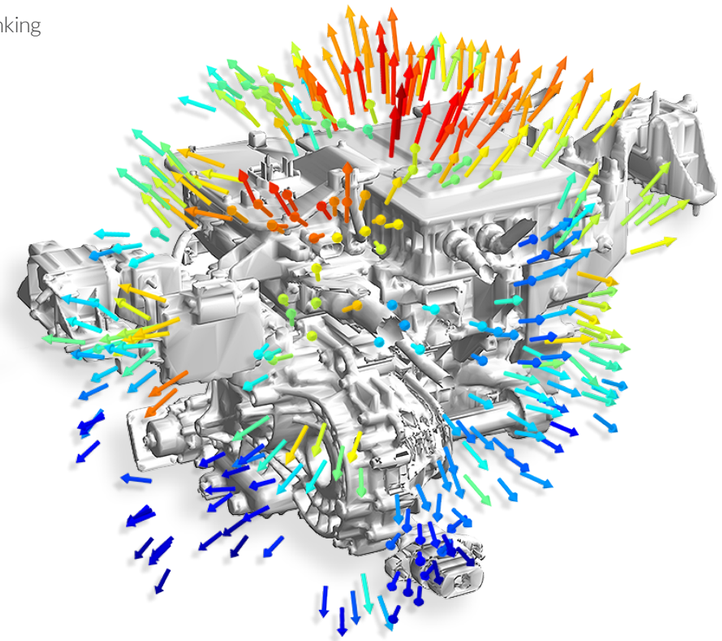
Simply position the probe (array) close to the device under test, run a measurement capturing the acoustic data during the operational regime of interest, and then reposition the probe (array) as many times as needed. The recorded data is then synchronized using an external signal consistently present across all recordings, allowing for detailed visualization of sound pressure, particle velocity, or sound intensity fields. This results in a comprehensive 3D representation of the sound's spatial distribution throughout the entire operational cycle.

FEATURES

- **Frequency range: 20 Hz - 10 kHz**
- **Comprehensive 3D sound visualization for transient events and time-varying operational regimes**
- **Intuitive, user-friendly software for efficient data gathering and processing**
- **Real-time acoustic data analysis and playback capabilities**
- **Sophisticated output analysis with a wide array of customizable visualization options**
- **Flexibility and scalability for any number of 3D sound intensity probes**
- **Export data in multiple formats, such as CSV, XLSX, OBJ, PNG, AVI, and PDF**

TYPICAL APPLICATIONS

- Noise source identification and ranking
- Squeak & Rattle noise
- Vehicle acoustics
- Powertrain NVH
- Component testing



IN-SITU ABSORPTION

NON DESTRUCTIVE IN-SITU MATERIAL TESTING

A truly in-situ method to accurately measure the acoustic properties of your materials. It only takes minutes to get the sound absorption or reflection for a sample.

There are many unwanted noise sources in our industrialised society. Acoustic noise pollution can be reduced by absorbing sound energy. Absorbing material packages are used in many applications to attenuate sound. Knowing exactly the acoustic properties of your materials and the effectiveness of the applied material packages is a requirement to successfully reduce noise levels. The In-Situ Absorption setup is a hand-held system which will allow you to determine the acoustic properties of virtually any surface, even curved and irregular surfaces. Moreover thanks to the properties of the particle velocity sensor, sound absorption and reflection coefficients can be measured in-situ, in almost any environment and for any material size. Now you're able to perform in-situ absorption measurements, allowing the characterization of already installed structures.

When combined with the Scan & Paint system, the In-Situ Absorption setup can also be used to visualize the spatial disruption of the absorption or refection coefficients.

HOW DOES IT WORK?

The setup is based on a spherical loudspeaker and a PU sensor, with which two measurements are performed to characterize the acoustic properties of a surface. The first measurement is taken with the PU probe pointing away from any reflective surface. This step is meant to calibrate the probe within the systems operating frequency range (300 Hz – 10 kHz). The second measurement is taken very close to the samples surface, in order to acquire the incident and reflected energy. Both datasets are then post-processed to:

1. Remove room effects: signal smoothing is applied to minimise the impact of reflections.
2. Model the results: the three available calculation methods are meant to translate the measured acoustic impedance into the sound absorption and reflection coefficients. Main differences between the calculation techniques lay in their degree of complexity and assumptions taken about the sound field. Choose a method which best fits your scenario.

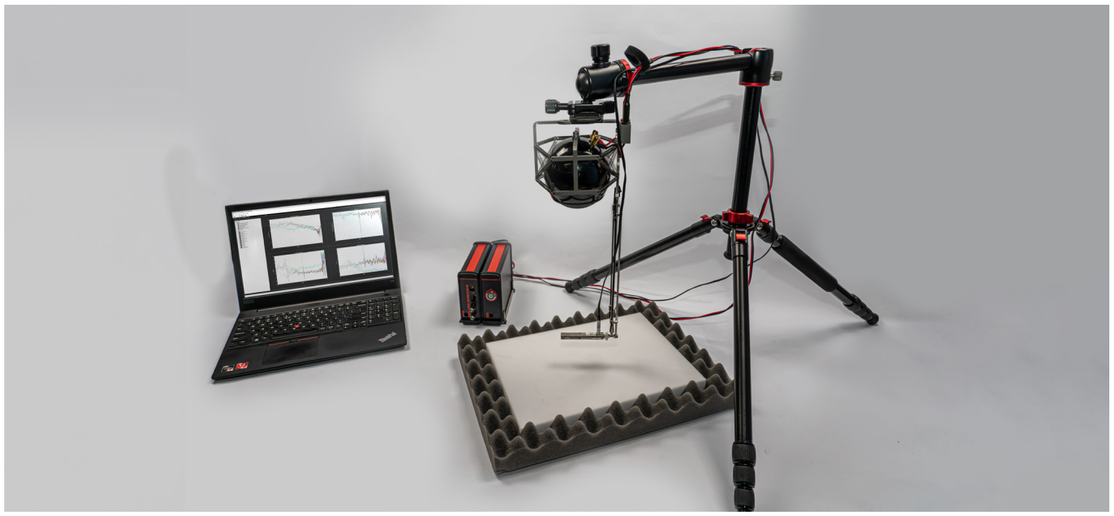
Post-processing of measurements taken with the In-Situ Absorption system takes only a few of seconds.

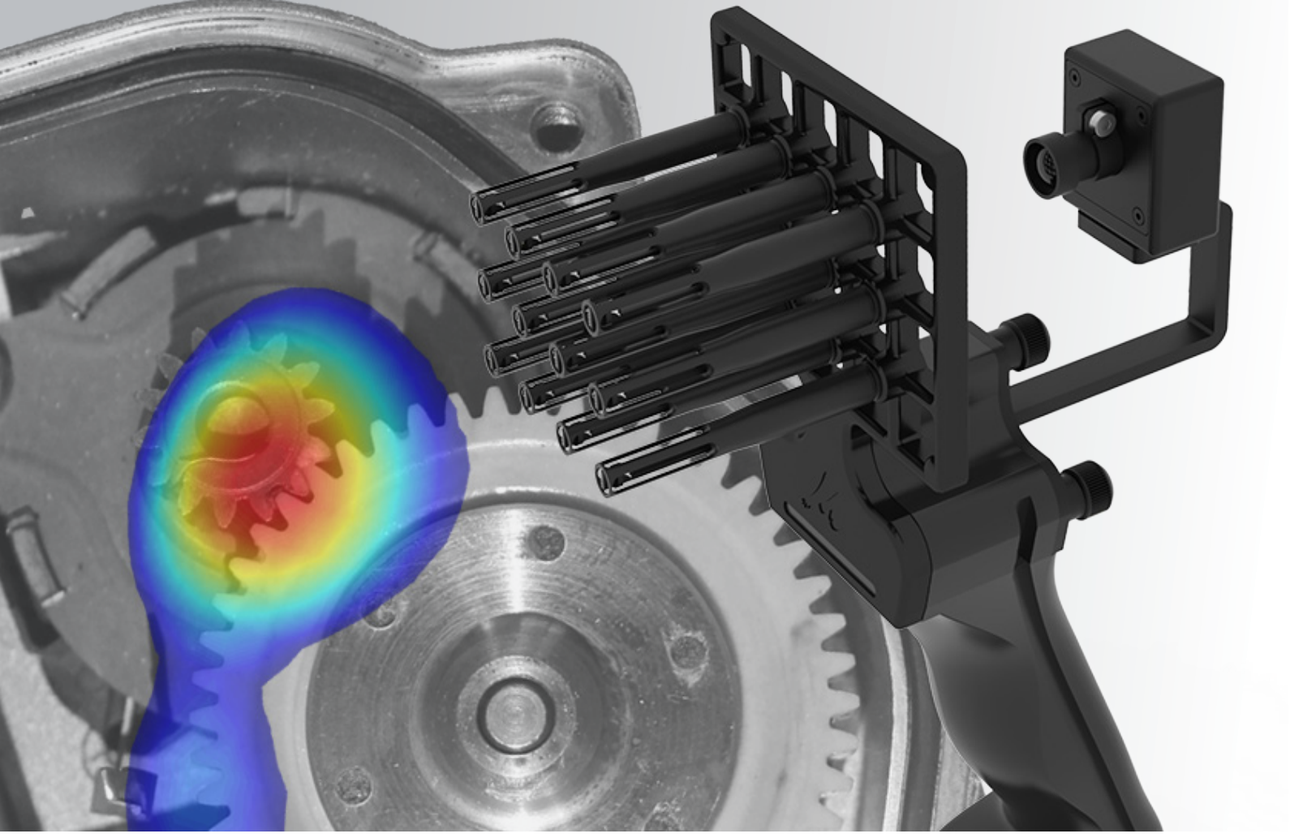
TYPICAL APPLICATIONS

- Material sample testing
- EOL Quality Control
- Component testing
- Trim package validation

FEATURES

- **Frequency range 300 Hz - 10 kHz**
- **In-situ method of:**
  - **Impedance**
  - **Sound refection coefficient**
  - **Sound absorbtion coefficent**
- **Non destructive method**
- **Portable solution**
- **Normal & oblique angles of incidence**
- **Flat & curved surfaces**
- **Homogeneous & inhomogeneous materials**
- **Easy to operate**
- **Mapping absorption coefficients using Scan & Paint add-on**
- **Reference Sample**





NF ACOUSTIC **CAMERA**

REAL-TIME SOUND MAPPING OF TRANSIENT NOISES

The Microflown Acoustic Camera is a flexible and versatile all-in-one box solution, which allows for real-time localization and analysis of non-stationary noises such as squeaks, rattles and clicks. All that, can be done either by a direct sound field visualization technique, or by employing acoustic holography algorithms for near-field sound reconstruction.

Sound source localization of transient and other non-stationary noises requires a simultaneous measurement with multiple sensors. The Acoustic Camera is a tool for real-time sound field visualization.

It is a perfect tool for diagnostics and localization of non-stationary noise sources from product development stage till end of line quality control. Thanks to the unique properties of the Microflown sensor, the localization task can be performed not only in real-time, but also in any measurement environment, and in a broad frequency range (20 Hz -10 kHz). Making the Microflown Acoustic Camera the only system capable of accurate real-time sound source localization below the barrier of 200 Hz. Furthermore, to maximize the potential of a Microflown sensor array, the acoustic camera software can be equipped with acoustic holography algorithms.

HOW DOES IT WORK?

The provided PU probes enable direct measurement of both sound pressure & particle velocity, as a result, the sound intensity can be obtained by taking the time averaged product of both signals. This allows for sound intensity measurements across a broad frequency range (20 Hz to 10 kHz – no spacers required). Additionally, when the size of the measured area is known, the sound power of the object under test can easily be calculated within the Acoustic Camera software.

There is no need to preserve a defined spacing between the probes in the array. Thus the Acoustic Camera can also be configured as a scattered array, allowing to accurately measure curved surfaces and complex geometries.

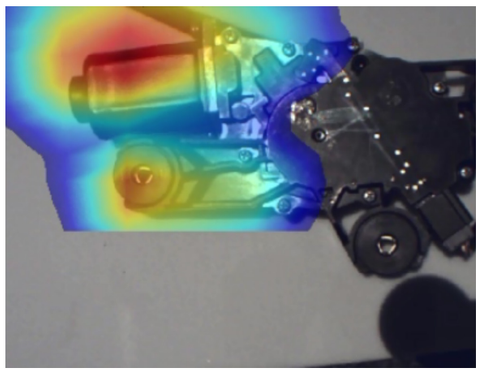
The physical properties of particle velocity and the design of the sensors make our systems less susceptible to background noise. Therefore accurate sound intensity and sound power results can be obtained in situations with a high sound pressure over sound intensity ratio (P/I index). This unique feature makes this system a superb engineering tool for troubleshooting, benchmarking, or quality control of all kinds of objects in-situ. In practice, there are many cases where anechoic conditions are not applicable, for instance in an industrial manufacturing environment, or a car interior. The Acoustic Camera is a solution which does not require any compromise when taking measurements even in acoustically challenging environments.

FEATURES

- **Frequency range: 20 Hz - 10 kHz**
- **Transient noise**
- **Large dynamic range of visualization**
- **Sound field reconstruction capabilities: near field acoustic holography**
- **High, frequency independent, spatial resolution**
- **Flexible geometry and size of the array**
- **Real-time sound field visualization:**
  - **Sound pressure**
  - **Particle velocity**
  - **Sound intensity**
  - **Sound power**
- **Order analysis tools**
- **Applicable in (real) operating environments**

TYPICAL APPLICATIONS

- Noise source identification and ranking
- Squeak & Rattle noise
- Vehicle acoustics
- Powertrain
- Component testing



SCAN & LISTEN

PARTICLE VELOCITY MADE AUDIBLE

Human ears are only sensitive to changes of sound pressure. With Scan & Listen, particle velocity is now audible as well.

Experience sound in a way you never could before. Identify noise sources even in situations where high levels of background noise are present. Locating sound sources in practical environments can be difficult.

Especially in situations with non-stationary sources which produce squeak & rattle noises. The Scan & Listen is typically used perfroming short quick scans, instead of time consuming series of point-by-point measurements. Often just by listening to particle velocity, you can obtain a good understanding of the main noise emission areas, without having to perform a long and cumbersome measurement campaign.

HOW DOES IT WORK?

Scan & Listen offers an intuitive method for sound source localization. It is an engineering tool designed to detect noise emission hotspots and acoustic leakage. Quick, intuitive, mobile, simple and robust, are the keywords describing the Scan & Listen and its usage.

The system allows to route the signal produced through the particle velocity sensor, or sound pressure microphone, directly to a headset. Furthermore, the device is capable of sending all acquired signals to a line out port, thus allowing for their recording. The listening and the recording can be done simultaneously.

TYPICAL APPLICATIONS

- Noise source identification
- Sound source dynamic behavior determination
- Squeak & Ratlle noise localization
- End of line quality control

FEATURES

- **Direct listening to particle velocity and sound pressure**
- **Quick, intuitive, mobile, simple and robust**
- **In the near field, particle velocity is less susceptible to background noises and reflections**
- **Applicable in operating environments e.g. non-anechoic conditions**
- **Portable single sensor solution**
- **Compatible with multiple frontends**

Volume adjuster
Set the headphones volume output for particle velocity or sound pressure.

Channel selection
Choose the channel, particle velocity (U) or sound pressure (P), that you would like to listen to.

Headphone connection
Connect the included headphones.

Line out
Record output for both P and U channels.

Sensor input
Input connector to connect the PU probe.

SOUND
POWER RANKING

COMMUNICATING IN SOUND POWER

Sound power is a suitable approach for benchmarking and compliance tests, providing robust and repeatabtle results

The Microflown sensor opens a new approach for sound power measurements on e.g. (electric) drivelines or components. The muti-capture module of the Analyser software enables to combine multiple data-sets and link an arbitrary set of measurements to a particular area of devices, machines or structures investigated. Sound power (ranking) of noise sources is a suitable approach for benchmarking and compliance tests, providing robust and repeatable results. PU sensors are offering companies a viable solution to have the testing capabilities in house. Quantitative measurement results make it that sound power can be considered as a very good “communication tool” between different parties e.g. OEM’s and Suppliers. With small PU intensity probes it is easy to apply an array of multiple sensors e.g. around a driveline, and capture the whole object in one measurement. This enables to measure the sound power for non-stationary conditions as for example during an engine run-up.

HOW DOES IT WORK?

Sound power is commonly used as a quantitative description of the acoustic output of a device. It describes the acoustic impact of a machine or device in its operational environment. The Microflown sensor opens a new approach for sound power measurements on drivelines or components. The sensors enable direct measuring of both sound pressure & particle velocity, thus the sound intensity can be intuitively obtained by taking the cross spectrum between both; allowing sound intensity and sound power measurements across a broad frequency range. Furthermore the sensors are hardly affected by the environment, allowing measurements in situations with a high pressure over intensity ratio (p/I index) making it possible to measure directly at a test bench. In combination with the order analysis sub-module, the RPM and Orders can be used to synchronize the multiple captures. This allows to see the overall sound power per order or for selected order ranges. The possibility to create measurement templates speeds up the working procedure and furthermore offering a platform that ensures robust data for repeatable measurement campaigns. Furthermore sound power ranking tables can be generated. The table provides detailed insight to the contribution of (sub-) components contributing to overall sound power.

TYPICAL APPLICATIONS

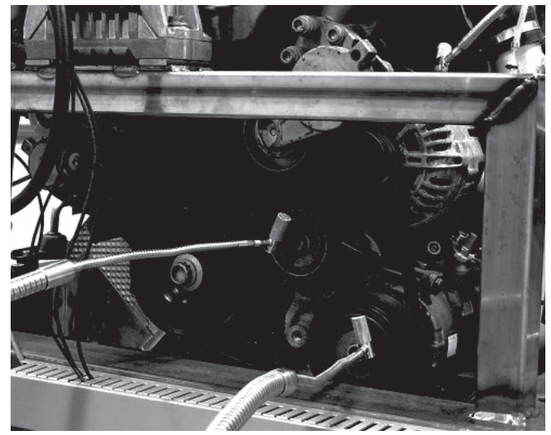
- In-situ sound power estimation
- Total sound power level
- Sound power ranking
- Sound power per order(s)
- Machinery
- Powertrain
- Electric Vehicles
- Appliances & Electronics

REQUIREMENTS

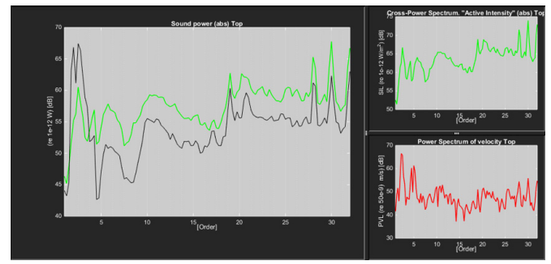
- PU Probes
- Analyser Base // SW-SA
- Analyser Multi Capture // SW-SA-MC
- Analyser Order Analysis // SW-SA-OA
- Irregular Grid // IRG-PM2

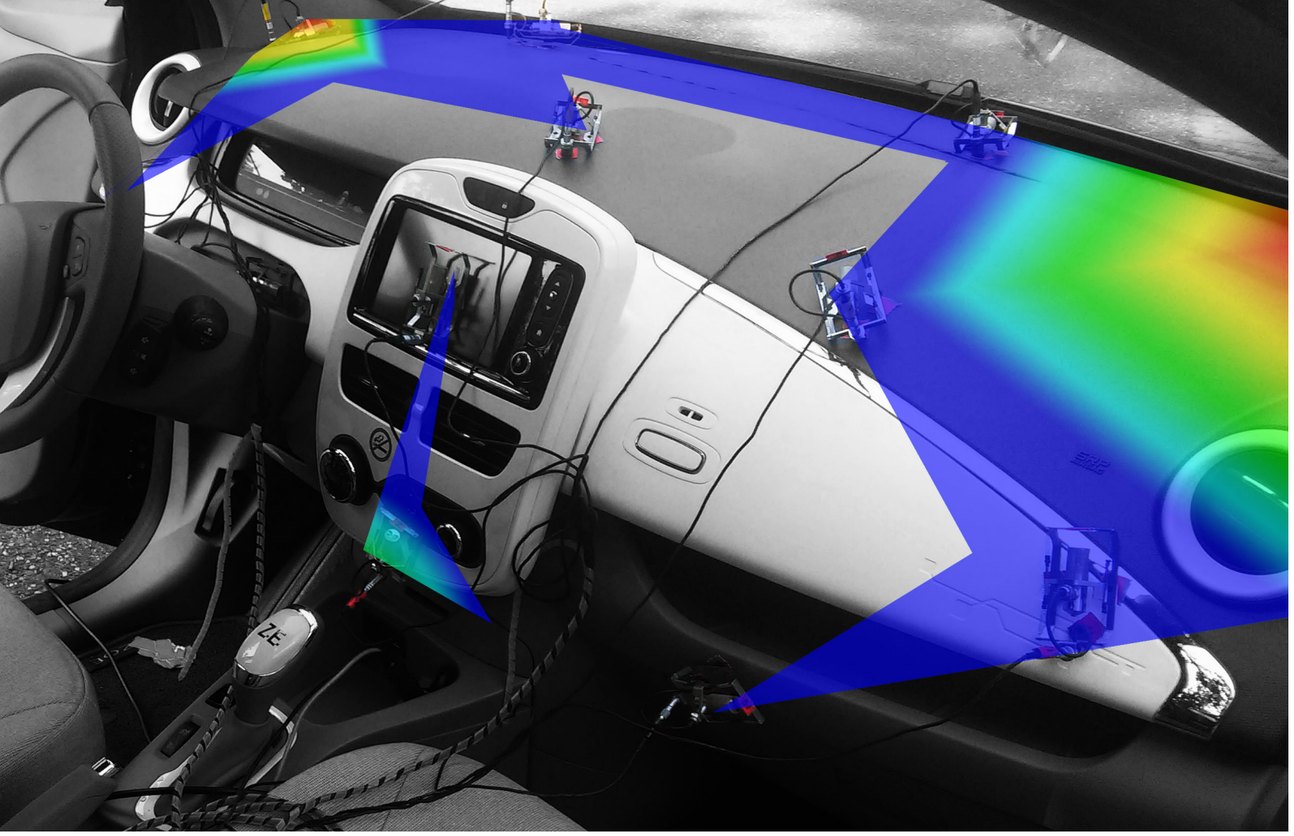
FEATURES

- **Frequency range: 20 Hz - 10 kHz**
- **Total sound power level**
- **Sound power ranking**
- **Sound power per order(s)**
- **Low suceptibility to pressure over intensity (p/I)**
- **Easy to apply array configuration**
- **In-situ, operating conditions**



			Area (m^2)	PWL (dB)	Intensity (uW/m^2)	Total contribution %
Total			0.1688	74.24	0.1575	
	Front Face		0.0338	72.64	0.5443	69.1206
		Front	0.0338	72.64	0.5443	69.1206
	Cabinet		0.1350	69.14	0.0608	30.8794
		Side Right	0.0338	62.28	0.0501	6.3618
		Top	0.0338	58.55	0.0212	2.6978
		Side Left	0.0338	63.52	0.0667	8.4644
		Back	0.0338	65.50	0.1052	13.3554





PANEL NOISE CONTRIBUTION

DETAILED ACOUSTIC ANALYSIS OF A VEHICLE INTERIOR

The Microflown PU-based Panel Noise Contribution Analysis is a very fast and accurate method to measure and analyse sound source locations and their local contributions.

The Panel Noise Contribution Analysis (PNC) is a well-known methodology for an airborne Transfer Path Analysis (TPA) in a car interior. Pressure contribution from individual panels towards a reference point can be very accurately calculated. The Microflown PNC method uses only PU-probes for measuring source strength as well as transfer function by reciprocal measurements. Thanks to the physical advantages of particle velocity over sound pressure, there is no need for acoustic treatment of the interior under test. This allows to perform simultaneous multipoint PNC measurements of a full car interior in a short time.

HOW DOES IT WORK?

Four steps are required to determine the contributions from all areas (panels e.g.: drivers' door, headliner) of the vehicle interior. Typically the whole car interior would be divided into 11 panels. Each panel would be measured with 11 PU probes. Four steps are required to perform panel noise contribution analysis:

1. The probes are attached to the car interior surfaces (car doors, headliner, dashboard, etc.)
2. Source strength: this measurement needs to be performed while the vehicle is exciting the sound field. This step can be done on a roller test bench but it is also possible to perform the measurement while driving the vehicle on the road, thus including e.g. wind noise. The source strengths are determined by measuring the acoustic particle velocity close to the panel surfaces.
3. Transfer path measurement: this measurement is done reciprocally by using an omni-directional sound source at the reference position and measuring the sound pressure at the panels. The vehicle has to be parked with the engine turned off.
4. The operational data (step 2) are linked with the measured transfer paths (step 3). The individual panel contributions are calculated towards a specific reference point. In a car interior this would typically be the drivers' ear.

TYPICAL APPLICATIONS

- Acoustic optimization of vehicle interior
- Sound package optimization
- Troubleshooting

REQUIREMENTS

- PNC software // SW-SA-PNC
- Array of PU probes
- Monopole sound source // LVVS, MHVVS
- Reference microphone // REF-MIC

FEATURES

- **Frequency range: 100 Hz - 2 kHz**
- **High degree of detail**
- **Very fast: perform measurements on a full car interior in 1 day**
- **Flexible: scattered array, measure whilst driving**
- **Structure and acoustic properties of the vehicle are unaltered by the measurement**
- **Applicable in (real) operating environments, e.g. reverberant environments**

SENSORS

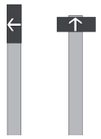
PU PROBES / 1D

The PU probes comprise of one directional particle velocity sensor and one omni-directional sound pressure MEMS-microphone. The PU probes are the most popular Microflown sensors and they are used in a range of Microflown solutions, such as Scan & Listen, Scan & Paint and the Acoustic Camera. Sound intensity is easily calculated by taking the time averaged product of the particle velocity and sound pressure signals. This makes the PU probes true sound intensity probes, covering the full frequency range from 20 Hz - 10 kHz.

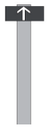
PU Mini // PM
Single sensor kit, including: MFPA-2, cabling, calibration report, protective case. // KIT-PA-PM

PU Match 0 & 90 degrees // PTN0 & PTN9
Single sensor kit, including: MFPA-2, cabling, calibration report, protective case. // KIT-PA-PTN0 & KIT-PA-PTN9

0° & 90°



PU Voyager // PV
Option to Voyager Standard(+) including: cabling, calibration report, protective case. // PV



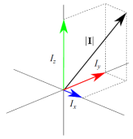
PU Regular GEN 2 // PRG2
Single sensor kit, including: MFPA-2, cabling, calibration report, protective case. // KIT-PA-PR

Properties	PRG2	PM	PTN0/9	PV
Length:	122 mm	41 mm	58 mm	97,5 mm
Body diameter:	12,7 mm (1/2")	12,7 mm (1/2")	7 mm	12,7 mm (1/2")
Connector type:	7 pin Lemo F	4 pin Lemo F	4 pin Lemo F	4 pin Lemo F
Velocity sensor				
Frequency response (±1 dB)	50 - 12.000 Hz	40 - 8.000 Hz	80 - 8.000 Hz	100 - 7.000 Hz
Frequency response (±2 dB)	30 - 14.000 Hz	20 - 10.000 Hz	20 - 10.000 Hz	20 - 8.000 Hz
Max. PVL (re 5e-8 m/s):	126 dB	125 dB	130 dB	130 dB
Pressure sensor				
Frequency response (±1 dB)	80 - 6.000 Hz	60 - 7.000 Hz	40 - 10.000 Hz	100 - 7.000 Hz
Frequency response (±2 dB)	50 - 14.000 Hz	20 - 10.000 Hz	20 - 10.000 Hz	20 - 8.000 Hz
Max. SPL (re 2e-5 Pa) :	131 dB	112 dB	130 dB	130 dB

USP PROBES / 3D

The USP probe is Microflown's most extensive sound probe. It is a true 3D sound intensity probe. It comprises of three orthogonally placed directional particle velocity sensors and sound pressure microphone. The USP probe is a standard product in the Scan & Paint 3D system, but can also be used for other applications such as End Of Line quality control or function as an Acoustic Vector Sensor.

USP Regular // UR
Single sensor kit, including: MFPA-4, cabling, calibration report, protective case. // KIT-PA-UR



Properties	UR
Length:	128 mm
Body diameter:	12,7 mm (1/2")
Connector type:	7 pin Lemo F
Velocity sensor	
Frequency response (±1 dB)	40 - 8.000 Hz
Frequency response (±2 dB)	20 - 10.000 Hz
Max. PVL (re 5e-8 m/s):	130 dB
Pressure sensor	
Frequency response (±1 dB)	40 - 8.000 Hz
Frequency response (±2 dB)	20 - 10.000 Hz
Max. SPL (re 2e-5 Pa) :	112 dB

SOUND CALIBRATOR

The Microflown Sound Calibrator is a Class 1 precision acoustic calibrator, designed to provide quick and efficient field calibration for Microflown sensors and probes. Our acoustic calibrator is battery-operated and conforms to both IEC 60942 and ANSI S1.40 standards, ensuring its high accuracy. Offering two distinct levels and frequencies, it enables a thorough verification of sensor sensitivity for both sound pressure and particle velocity sensors. Moreover, the Microflown Sound Calibrator measures environmental parameters like air pressure, temperature, and humidity, displaying them on a user-friendly OLED screen. Each unit is accompanied by an accredited calibration certificate for guaranteed precision and reliability.

Class 1 Microflown Sound Calibrator
including adapter for PU Voyager probe // CAL-MSC-PV
including adapter for PU Gen2 probe // CAL-MSC-PRG2

FRONT ENDS

DAQ / DATA ACQUISITION SYSTEMS

Data acquisition systems are used to convert analog to digital signals. The digital data is then transferred for recording via a USB-connection to the computer. All Microflown solutions are equiped with the Scout V2. Only the Acoustic Camera includes a Zodiac data acquisition system, which provides 24 channels of analog to digital conversion.

Scout V2 | 4 Channel DAQ // SCT2

The Microflown 4 channel data acquisition system is the standard product for most of the Microflown solutions. The Scout V2 is equiped with inputs for 4x line level channels, tacho, external trigger and two outputs (line out and amplified).

MECALC// DECA**Q**

Integrated solutions for larger measurement landscapes

DECAQ systems provide appropriate architecture to address both standard and complex multi-channel tasks. Using the same stable modular platform for high-quality signal conditioning, the compact DECAQ can contain up to 192 channels in a single chassis. . DECAQ chassis are conveniently portable for field measurements or rack-mountable, with simplified cabling and secure handling, for higher channel count measurements. The MeCalc DECAQ is our supported and recommended platform for multichannel (16+) solutions, such as Acoustic Shape and NF Acoustic Camera.

SIGNAL CONDITIONERS

MFPA / PREAMPLIFIERS

The latest Microflown preamplifiers (MFPA) improves the quality and usability of the measurement chain:

- Your probe and signal conditioner do not longer need to be matched for calibration, the new preamplifiers are now interchangeable and offer more flexiblity.
- New circuitry allowed us to lower the self-noise and support the sensor's full dynamic range of over 130 dB, eliminating the need of the High/Low Gain switch. This makes the new preamplifiers not only more user friendly but also error-proof.
- The new MFPA is provided with 1, 2 or 4 inputs, adapted to your corresponding probe type.

1 to 4 Channel Preamplifier // MFPA-1 , MFPA-2 , MFPA-4

The Microflown signal conditioners are designed to power various types of probes and amplify the received signals for further processing. The 1-channel signal conditioner is specifically used to power and amplify the particle velocity signal from any 1D velocity probe, providing a line level BNC output. For applications requiring both pressure and particle velocity measurements, the 2-channel signal conditioner is employed to power PU probes and amplify the received pressure and particle velocity signals. It offers two channels of line level BNC output. In cases where sound pressure and particle velocity signals need to be processed simultaneously, the 4-channel signal conditioner is utilized. It powers a USP probe and amplifies the received sound pressure signal (1x) and particle velocity signals (3x) to provide four channels of line level BNC outputs.

24 Channel Preamplifier // MFPA-24 & MFPA-24B

The MFPA-24 enables the direct connection of 12 PU probes (2 channels per probe) to a front-end, eliminating the need of separate signal conditioners for every probe. The MFPA-24B enables the direct connection of 12 PU probes (2 channels per probe) to our hand held array platform via single 50 Pin multi-core cable. The electronics provide power to the probes and amplify the received particle velocity and sound pressure signals to line level outputs.
The output connector is a 50 pin Sub-D, compatible with the 50 pin Sub-D to 24 BNC cable (CAB-50-24BNC).

SOUND SOURCES

VVS / VOLUME VELOCITY SOURCES

Microflown volume velocity sources (VVS), also known as a sound monopole or acoustic point source, can be used for a wide range of applications like transfer path analysis, airborne source quantification, component vibroacoustic behavior characterization, airborne source quantification and pass by noise simulations.A Microflown high dB sensor at the nozzle allows measuring directly the emitted volume velocity in m^3/s.

Low Frequency VVS | 30 - 500 Hz // LVVS

Including:

- High dB Match (volume velocity sensor)
- 1 Ch. preamplifier // MFPA-1 or MFPA-VVS
- Power amplifier for the driver
- Accessories // cabling, power supplies, probe case
- Pelican Case

Mid-High Frequency VVS | 300 - 12.000 Hz // MHVVS

Including:

- High dB Match (volume velocity sensor)
- 1 Ch. preamplifier // MFPA-1 or MFPA-VVS
- Integrated power amplifier for the driver
- Accessories // cabling, power supplies, probe case
- Pelican Case

Properties	LFM
Frequency range:	30 - 500 Hz
Height:	445 mm
Body diameter:	330 mm
Weight:	11.8 kg
Tube outer diameter:	160 mm
Tube inner diameter:	150 mm
Power RMS / Maximum input signal (RMS):	200 W / 40 V
Sound power level:	122 dB
Sound pressure @ 1meter:	111 dB

Properties	MHVVS
Frequency range:	300 – 12.000 Hz
Height:	95 mm
Body diameter:	200 mm
Weight:	5 kg
Hose (diameter / length):	44 / 3.000 mm
Nozzle (diameter / length):	14 / 90 mm
Power RMS:	60 W
Sound power level:	107 dB
Sound pressure @ 1meter:	96 dB

MFPA VVS / VOLUME VELOCITY SOURCES

Introducing the MFPA-VVS, a versatile 1-channel signal conditioner designed to power and amplify the received particle velocity signal from our Volume Velocity Sources. Its advanced correction capabilities provide a flat and corrected output, making it compatible with most sound and vibrations software. The MFPA-VVS features programmable filters that compensate for the natural frequency-dependent sensitivity of particle velocity sensors, achieving a broadband correction for accurate and reliable data. Compatible with both MHVVS and LVVS, the MFPA-VVS is a must-have for anyone seeking precise and reliable signal conditioning.

SOURCES THAT WILL HELP YOU FIND THE RIGHT DIRECTION

ACCESSORIES

PORTABLE / REMOTE CONTROL

Remote Handle // RH-01
The remote handle is a standard product of Scan & Paint 3D, but can be used as an add-on to other solutions.

The handle allows to remotely trigger the start and stop of a measurement. Moreover, the signal status and tracking performance are communicated with relevant LED's.

FIXTURES / PROBE ADAPTERS

Probe adapters are used to extend the package of the small probes, such as the PU Mini and PU Match, allowing the probes to be hand held.

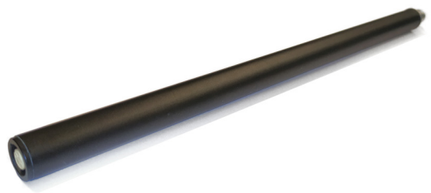
½" Probe Adaptor // ADP-PM
Suitable for:
- PU Mini // PM
- PU Match Packaged // PI

The adapter is used for applications where one of the mentioned probe packages is needed as standard ½" sized probe e.g. to make it hand held. It also makes the listed probe packages compatible with the Microflown Remote Handle (RH-01).

PU Match Handle // ACC-PTN
Suitable for:
- PU Match // PTN

The PU Match Handle allows the smallest sensors of the Microflown product family to be hand held. This accessory works as an adaptor from a 4p Lemo connector to a 7pin Lemo connector allowing the usage of thicker and better shielded cabling (CAB-LEMO-N-77).

Extension Bar 25 cm Sphere 3D // ACC-SP3D-EB
This extension bar can be placed in between the tracking sphere and the USP probe of a Scan&Paint 3D system. Using this extension will make it possible to reach narrow and physically hard to reach spots.



SOUND CALIBRATIOR / ADAPTERS

Adapter for PU Voyager probe // CAL-MSC-PV
This intricately engineered adapter is crafted to seamlessly integrate with the base of the calibrator, facilitating the precise alignment of the sensor of the PU Voyager probe for flawless calibration on every occasion.

Adapter for PU Gen2// CAL-MSC-PRG2
This intricately engineered adapter is crafted to seamlessly integrate with the base of the calibrator, facilitating the precise alignment of the sensor of the PU Gen2 probe for flawless calibration on every occasion.

ACCESSORIES

WIND CAP

Wind caps minimize the effect of the DC flow in your results on both the pressure and velocity channels.

Wind Cap // ACC-IW

The ½“ Indoor Wind Cap is specially developed to perform measurements under light wind conditions. It is applicable to any ½ inch, regular size probe. Not applicable to probes that are made ½” using an adapter.

The ½“ Indoor Wind Cap is made of a combination of material layers, allowing the measurement of the particle velocity with wind conditions, up to 15 m/s.

SIGNAL CABLES

Product name	Product code	Length [m]	Connector 1	Connector 2
2,5 meter 7pin male to 7pin male Lemo	CAB-LEMO-2.5-77	2.5	7 pin Lemo M	7 pin Lemo M
10 meter 7pin male to 7pin male Lemo	CAB-LEMO-10-77	10	7 pin Lemo M	7 pin Lemo M
10 meter 7pin male to 7pin female Lemo | Extension cable	CAB-LEMO-10-7F7	10	7 pin Lemo M	7 pin Lemo F
1 meter 4pin male to 4pin male Lemo	CAB-LEMO-1-44	1	4 pin Lemo M	4 pin Lemo M
2,5 meter 4pin male to 4pin male Lemo	CAB-LEMO-2.5-44	2,5	4 pin Lemo M	4 pin Lemo M
1 meter 4pin male to 7pin male Lemo	CAB-LEMO-1-47	1	4 pin Lemo M	7 pin Lemo M
2,5 meter 4pin male to 7pin male Lemo	CAB-LEMO-2.5-47	2,5	4 pin Lemo M	7 pin Lemo M
5 meter high temperature, low noise 4 pin male to 4 pin male Lemo	CAB-LEMO-5-44	5	4 pin Lemo M	4 pin Lemo M

ARRAY GRIDS

FIXTURES / FIXED GRIDS

Fixed array grids are grids that have a fixed amount of probes. These grids are used for Near Field Acoustic Camera applications.

Hand-Held Array | RECT-7.5 // ARR-GR-RECT7.5
Fixed grid compatible for PU Mini & Match, standard array configuration:

- 3x4 // 12 PU Mini or PU Match with a 75 mm inter-sensor spacing

Hand-Held Array | BiHex // ARR-GR-BIHEX
Fixed grid compatible for PU Mini & Match, standard array configuration:

- Hexagram, designed for optimal performance of Near Field Acoustic Holography)

Hand-Held Array | RECT-1.8 // ARR-GR-RECT1.8
Fixed grid compatible for Match, standard array configuration:

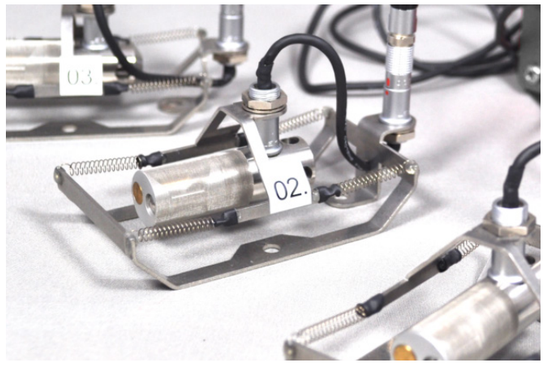
- 3x4 // 12 PU Mini or PU Match with a 18 mm inter-sensor spacing

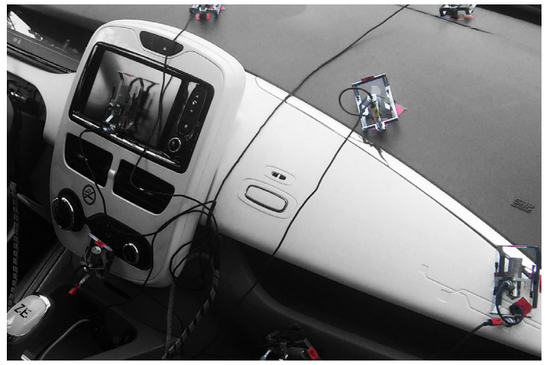
FIXTURES / SCATTERED GRIDS

The use of scattered arrays is one of the major benefits of Microflown's Acoustic Camera and PNCA-R applications. Scattered array fixtures allow to position a number of probes in an irregular fashion around the surface of the studied noise source. Depending on the circumstances one can choose to attach the probes to the surface using Scattered Array Mountings (for PU Mini only), or use flexible tubes with magnetic pods.

Irregular Grid for 12 PU Mini // IRG-PM2
Suitable for PU Mini's.
Including: 12x magnetic feet, 12x mounting for PU Mini, 10 meter flexible and extendable tube.

Scattered Array Mounting for PU Mini // SAM-PM2
This mechanically suspended Lemo connector decouples the connected PU Mini from structure born vibrations generated by the test object. Adhesive tape or velcro stickers can be used to attach these mountings directly on the surface of the test object.





SOLUTIONS

Microflown solutions include all hardware and software that is needed to start measuring and obtain the results as described in the previous sections of this product catalog. Laptop and accessories other than listed are only included on request.

Scan&Listen

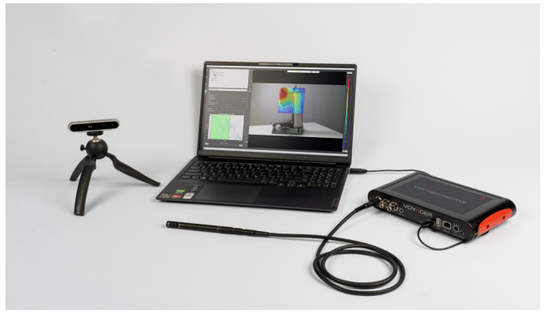
Detailed product information see page 20

Including:

- PU probe of choice
- Scan & Listen hardware device
- Beyer Dynamics DT-770 headphones
- Accessories // cabling, battery, probe case
- Pelican Case

Scan&Paint 2D

Detailed product information see page 22



Including:

- PU Gen2 probe
- Voyager // including DAQ firware license
- Intel RealSense D415
- Scan&Paint 2D software // Standard or Pro license
- Accessories // windcap, cabling, power supplies, tripod and probe case
- Pelican Case

Scan&Paint 3D

Detailed product information see page 24

Including:

- USP Regular
- Voyager/ / including DAQ firware license
- Scan&Paint 3D software
- PST-Iris IR stereo camera and tripod
- IR Tracking Sphere
- Remote Handle // RH-01
- Accessories // pointer, cabling, power supplies, probe case
- Pelican Case

Product name	Product codes				
	PU Regular	PU Mini	PU Match 0 deg	PU Match 90 deg	
Scan&Listen	SL-PR	SL-PM	SL-PTN0	SL-PTN9	
Product name	**Product codes**				
	LITE	**STANDARD**	**PRO**		
Scan&Paint 2D	SP-PA-PR-SCT2	SP-VYRS-PRG2	SP-VYRP-PRG2		
Scan&Paint 3D		SP3D-PA-UR-SCT2 OR SP3D-VYRS	SP3D-VYRP		

NEAR FIELD ACOUSTIC CAMERA

Detailed product information see page 26

Including:

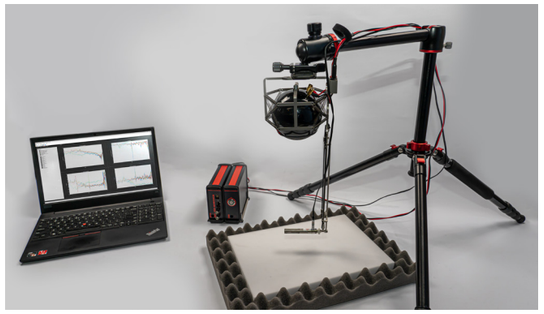
- Amount of PU probe // PM2 or PTN9
- Preamplifier // MFPA-24 or MFPA-24B
- Data acquisition // MeCalc DecaQ
- Acoustic Camera software // SW-AC
- Accessories // cabling, power supplies, USB camera, probe cases, grid configuration of choice
- Pelican Case

Optional:

- Near-Field Acoustic Holography // SW-AC-NAH
- Order Analysis // SW-AC-OA

In-Situ Absorption

Detailed product information see page 30



Including:

- PU probe of choice
- 2 Ch. preamplifier // MFPA-2
- 4 Ch. data acquisition // SCT2
- In-Situ Absorption software // SW-IMP
- Piston on a sphere hardware setup
- Accessories // cabling, power supplies, probe case
- Pelican Case
- Reference Sample

Voyager

Detailed product information see page 32

Including in VYR-S:

- Voyager Device
- Accessories // USB Cable, power supply, Pin Key Tool
- Pelican Case

Extra items in VYR-S+:

- Headphones - Sony WH1000-MX4
- Lanyard
- Manfrotto table tripod
- 3/8“ to 1/4”Adapter
- Hardcopy product manual

Optional:

- DAQ | Firmware license // FW-VYR-DAQ
- Sound Quality | Firmware license // FW-VYR-SQ

Product name	Product codes per probe		Voyager			
	PU Mini	PI Probe	Standard	Standard+	Lite	Lite+
In-Situ Absorption	IMP-PA-PM-SCT2	IMP-PA-PI-SCT2				
Voyager			VYR-S	VYR-S+	VYR-L	VYR-L+

SOFTWARE

VELO / MODULES

Velo is the Microflown software platform that combines the functionalities of nearly all Microflown systems into one integrated solution. Velo is fully configurable, therefore you can easily upgrade your Velo package with extra software applications or add-on modules.

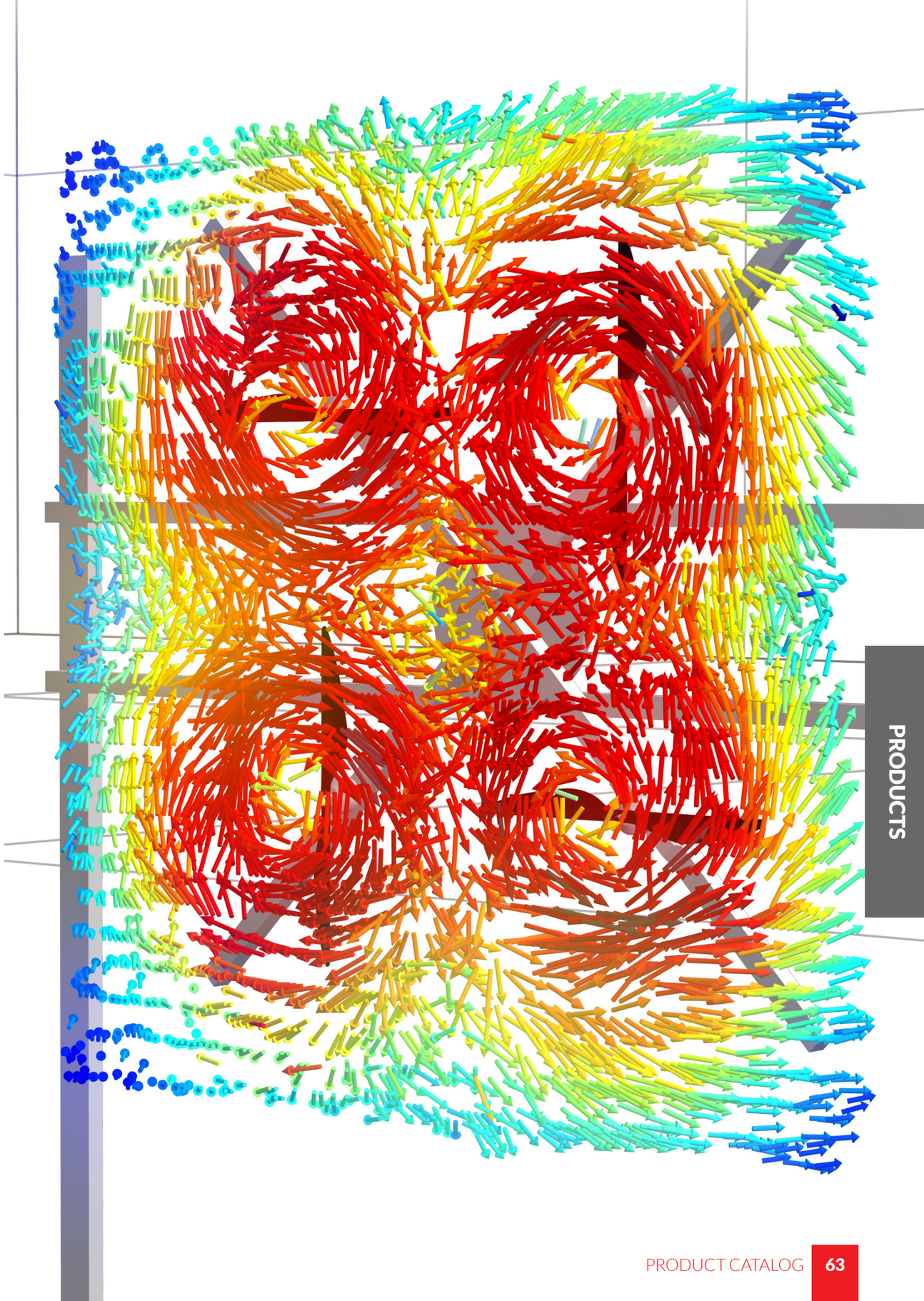
Velo 64-Bit | Software Licenses	
Product name	**Product code**
Scan&Paint 2D	
Pro License | Update Standard to Pro license	UPG-SP-PRO
Standard License | Update Legacy/Lite to Standard license	UPG-SP-STD
Lite (only for additional licenses)	SW-S&P-L
Standard (only for additional licenses)	SW-S&P-S
Pro (only for additional licenses)	SW-S&P-P
Scan&Paint 3D	
Pro License | Update Standard to Pro license	UPG-SP3D-PRO
Standard (only for additional licenses)	SW-S&P3D-S
Pro (only for additional licenses)	SW-S&P3D-P
Acoustic Shape	
Pro	SW-AS-P
Pro (only for additional licenses)	SW-AS-PML

Velo 32-Bit | Software Licenses	
Product name	**Product code**
Analyser	
Analyzer | Base module	SW-SA
Multi capture | Sub module	SW-SA-MC
Order Analysis | Sub module	SW-SA-OA
PNCA | Sub module	SW-SA-PNCA
TL Transmission loss | Sub module	SW-SA-TL
Scan&Paint 2D	
Scan & Paint 2D | Base module	SW-S&P
In-situ transmission loss | Sub module	SW-S&P-TL
Scan & Paint TPA | Sub module	SW-S&P-TPA
Material Testing	
In-situ Absorption | Base module	SW-IMP
Near Field Acoustic Camera	
NF Acoustic Camera | Base module	SW-AC
Near-Field Acoustic Holography | Sub-module	SW-AC-NAH
Order Analysis	SW-AC-OA

AQCURA / MODULES

AQCURA is the solution that combines cutting-edge sensor technology and advanced machine learning to objectively identify manufacturing defects and determine product quality.

Product name	Product code
Software packages	
AQCURA Lite (Tester LITE + Manager LITE)	AQC-L
AQCURA Standard (Tester Standard + Manager Standard)	AQC-S
AQCURA Standard+ (Tester Standard + Manager Standard)	AQC-S+



SUPPORT SERVICES

The service contracts can be ordered for an initial contract length of 1 year. You have the option to choose whether you would like the contract to be automatically renewed or whether it should expire after the contract period ends.

SSC+ / EXTENDED WARRANTY

To our customers that have a Software Support Contract (SSC) we offer the SSC+. This will additionally give you an extended warranty for the period of the contract. Please contact Microflown or one of our local partners to obtain more information.

SSC / SOFTWARE & SUPPORT CONTRACT

The Software & Support Contract (SSC) ensures that you always run the latest software version including all improvements and new features. The SSC includes discounts on maintenance, hardware upgrades, trainings, access to additional educational materials, and much more. Take advantage of the full range of services and personal support to achieve the best quality and efficiency in your core work.

DIRECT SUPPORT

Personal support: our team of experts is available to you for direct and personal support. With the SSC you benefit from priority service, available through telephone, skype and e-mail.

On-site support: as an SSC holder you get 10% discount on on-site training, installation, consulting and engineering services.

EDUCATION

Training: get 30% discount on dedicated training for small groups at our office and benefit from the expertise of our experienced trainers.

SOFTWARE

Releases and new features: being an SSC holder you are guaranteed to have access to all new software releases. Benefit from all improvements and new features!

Software reliability: Microflown commits to keep your software updated and compatible with new Windows releases. Backward compatibility is provided until Windows XP.

DISCOUNTS

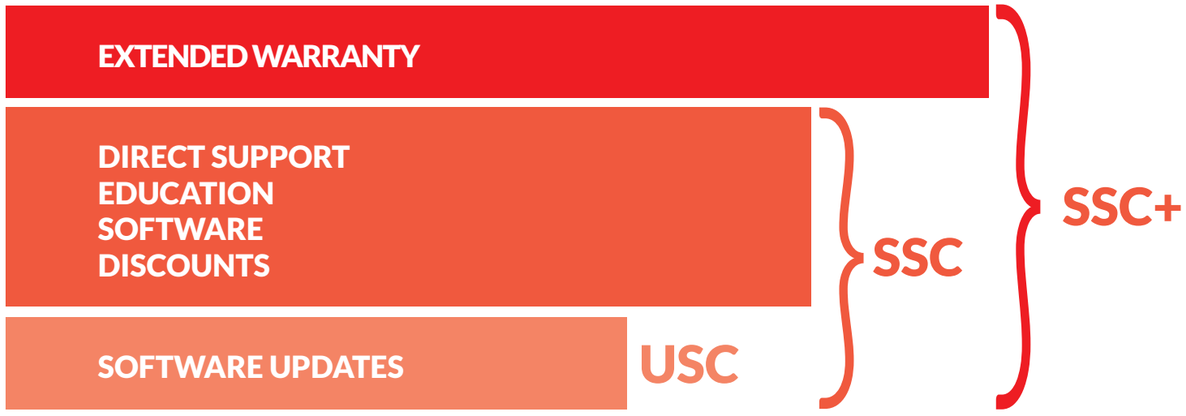
Calibration: having your Microflown sensors calibrated every two years ensures the performance of your system. You receive a 30% discount on calibration of your equipment at our accredited service center.

Repair: for repairs excluded from warranty, a 30% discount on the repair costs is provided. Furthermore, as a SSC holder, you get the highest priority, granting a return of your equipment within 7 days, to ensure the continuity of your operations.

Rental: for your temporal need of additional equipment a 20% discount on rental prices is offered.

USC / UPDATE SERVICE CONTRACT

An Update Service Contract is offered (USC) too. This will solely provide you with the new software releases, but none of the SSC and SSC+ features.



CALIBRATION

Be it for ISO like compliance, or to guarantee accurate results, instrumentation needs to be recalibrated periodically. We advise to recalibrate the Microflown sensor once per 2 years. In our lab, we use reference sensors that are recalibrated annually at an accredited lab. We aim for short turn around times, whereas as SSC holder you'll have priortiy service.

All type of Microflown sensors, be it single or in arrays, can be send for calibration. Furthermore specific calibration is offered for product with an embedded Microflown sensor such as our volume velocity sources. Standard the new calibration data is supplied in the following formats: printed report, PDF file and XML file.

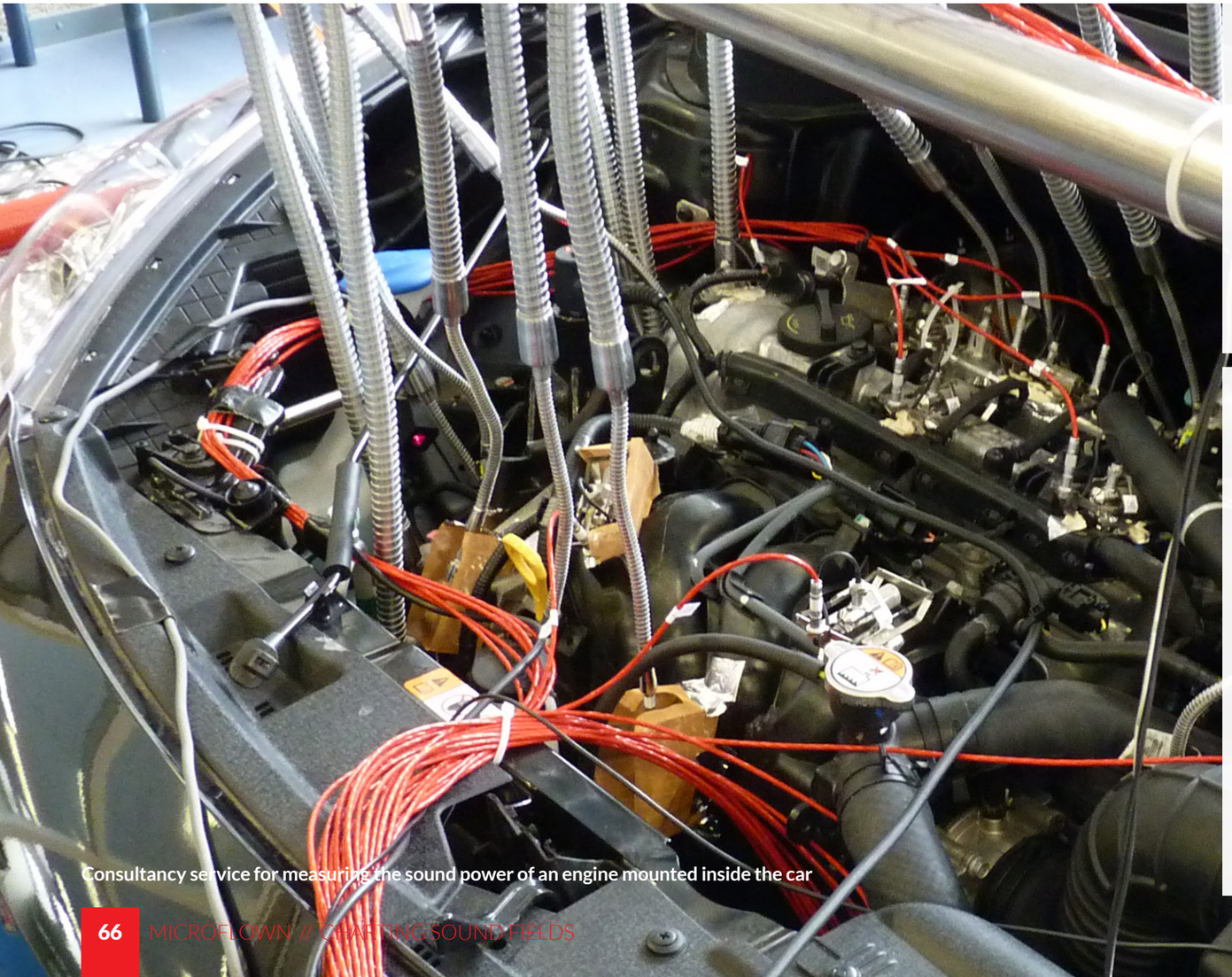
In order to process a repair or calibration service request as smoothly and efficiently as possible, we have set up an RMA procedure. Please don not return any goods without an assigned RMA number.

ENGINEERING SERVICES

ACCURATE / EFFICIENT / EXPERTISE

Microflown Technologies offers a range of engineering services in the field of acoustics and vibrations. Our engineers have years long expertise in acoustics, NVH applications and signal processing. The unique Microflown sensors can be deployed for daily occuring issues or a single day measurements campaign, for troubleshooting, benchmarking, material testing and environmental noise. Depending on your application and wishes, the engineering services can include on-site or in-house measurements, the rental of equipment, and the expertise of our engineers, ensuring the most efficient solution.

For further information contact us at:
info@microflown.com



Consultancy service for measuring the sound power of an engine mounted inside the car

TROUBLESHOOTING & BENCHMARKING

Troubleshooting and benchmarking services are applicable to complete products or subcomponents in all sorts of industries, such as automotive, white goods, consumer electronics, etc. Using our Microflown sensors, accurate results of your product's acoustic behaviour can be obtained without the need for anechoic conditions or other forms of acoustic treatment. Combined with the engineering and NVH know-how of our specialist team, your troubleshooting and benchmarking research is solved effeciently and accurately.

ACOUSTIC MATERIAL TESTING

Our unique sensors offer the possibility of in-situ surface impedance measurements. Our method allows verification of performance of (building) materials as installed, which is simply not possible with (destructive) Kundt's tube type of measurements.
Furthermore, we can map the acoustic impedance, as well as absorption and reflection coefficients over an image of your test object or material. Tests could be performed on anything from foam, layered panels, seats, asphalt, metal foam, liners, homogeneous and locally reacting materials.

NOISELOC LOCALIZATION

Noise is known to affect both the wellbeing and health of human beings. It is often caused by industrial activities far away from where people live. NoiseLoc is a rapidly deployable tool that allows the localization of an sound source within several days of measurements.
With the NoiseLoc system, we're offering a unique solution to the market that is able to localize and understand the roots of your environmental noise issue. This system is offered as environmental noise monitoring service directly to clients in the Netherlands. However, after sufficient education, it is also possible for acoustic consultans to rent the NoiseLoc system to perform such measurements on their own.

TRAINING & TECHNOLOGY SUPPORT

Perhaps you feel that the Microflown particle velocity sensors could benefit your acoustic research, but you still have questions on how to interpretate the results? Perhaps you´re seeking for more efficient measurement strategies?
We provide educational seminars on noise and vibration related to our products. This could either be in the form of centralized general seminars or personal orientated in-house training. Based on your needs, we focus on theory, practical real-world applications and hands-on training on accurate repeatable results.

PANEL NOISE CONTRIBUTION

Panel noise contribution is a method to measure and analyse the distribution and contribution of sound sources inside vehicles. Typically it requires a time consuming process of applying acoustic treatment and single point measurements that could take up to a month of work. Besides that, the acoustic material that is required alters the acoustic behaviour of the vehicle's interior.
Thanks to the uniques properties of particle velocity, PNCA-R tests can now be performed very fast and accurate. Our approach uses a scattered array of PU probes. This allows for a typical resolution of over 100 individual panel contributions to be measured in a single day. Furthermore, measurments can now also be performed while driving the vehicle on the road including e.g. wind and tire noise.

REFERENCES

Audi
Fiat Auto
Alstom
Electrolux
De Koningh
Visteon
Carcoustics
Volkswagen
MIRA
Opel
PZL Swidnik
ArcelorMittal
Nokia
Hyundai
Bentley
Tesla
Rolls Royce
Solar Turbines

CONTACT DETAILS

We are based in Arnhem, a pleasant 150.000 thousand citizen's city one hour from Amsterdam. Our head office is located in the building called *"de Enk"*. This building is the former headquarter of AkzoNobel, an Amsterdam stocklisted company.

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REDUCE THE PRESSURE IN YOUR WORK...

...GO FOR PARTICLE VELOCITY

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